



U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D.C. 20207

July 22, 1997

CERTIFIED MAIL

Ms. Jennifer N. Willis
Gater & Willis
3723 Canal Street
P.O. Box 30489
New Orleans, LA 70190

RE: FOIA Request S606074: Duggan v. Duncan Ceramics, Report 950907CWE7271 and related investigation reports and correspondence/
Your file: 95-1804, Your Client: Sherrell and Richard Duggan

Dear Ms. Willis:

Thank you for your Freedom of Information Act (FOIA) request seeking information from the Commission, made on behalf of the Duggans. The records from the Commission files responsive to your request have been processed and copies of the releasable responsive records are enclosed.

The enclosed records include file information generated by the Commission itself or its contractors for regulatory or enforcement purposes. These records are Establishment Inspection Reports and related documents pertaining to the inspections of Duncan Enterprises and Gare, Inc. The Commission has established management systems under which supervisors are responsible for reviewing the work of their employees or contractors. The file information materials are final and have been prepared and accepted by the Commission's staff under such review systems. The Commission believes that it has taken reasonable steps to assure the accuracy of the information.

The enclosed records include one Epidemiologic Investigation Reports with the underlying and supporting documentation. The Commission has received this information from its formal investigation systems. Through these systems the Commission hopes to learn when specific products are associated with illness, injury or death. The Commission believes that it has taken reasonable steps to assure the accuracy of this information. While conducting the interviews for the investigation report, Commission staff or contractors have spoken with the individuals involved in the incidents. Where possible, Commission staff have

examined the products reportedly involved in the incident. Although the Commission has investigated the incident described in the investigation report, the Commission has not necessarily determined the cause of the incident.

Other portions of the files where one of the companies has requested confidentiality must be withheld pursuant to Exemptions 3 and 4 of the FOIA, 5 U.S.C. §§ 552(b)(3) and (b)(4), and section 6(a)(2) of the Consumer Product Safety Act (CPSA), 15 U.S.C. § 2055(a)(2). FOIA Exemption 3 provides for the withholding from disclosure of matters that are specifically exempted from disclosure by another statute. In applying FOIA Exemption 3 in this instance we are applying in part section 6(a)(2) of the CPSA. Section 6(a)(2) prohibits the Commission from disclosing information that is exempt from disclosure under Exemption 4 of the FOIA. That exemption protects trade secrets and confidential commercial information. Confidential commercial information is information directly related to a firm's business that the firm has not made public and whose disclosure could give a substantial commercial advantage to a competitor. Specifically, we are withholding portions or pages (14, 19, 20, 29 and 30) of the 9/29/95 report concerning Duncan Enterprises that if disclosed would reveal confidential and proprietary formulation data.

We are also withholding a portion of page 1 of the Duncan Enterprises report pursuant to Exemption 5, 5 U.S.C. § 552(b)(5). Exemption 5 provides for the withholding from disclosure of inter-agency and intra-agency memoranda which would not be available by law to a party other than an agency in litigation with the agency. The withheld portion contains internal recommendations, opinions, suggestions and analyses of the Commission's technical staff. The materials constitute predecisional discussion that clearly falls within the deliberative privilege. Any factual materials in the records not covered by some other exemption are inextricably intertwined with exempt materials or the disclosure of the factual materials would itself expose the deliberative process. We have determined that the disclosure of these certain portions responsive to your request would be contrary to the public interest. It would not be in the public interest to disclose these materials because disclosure would impair the frank exchange of views necessary with respect to such matters.

From the report on Gare, Inc., dated 9/16 -24/96, we have removed statements in the report that may not be accurate or where the company has commented and called into question the accuracy of the information. We withhold the records pursuant to Exemption 3 of the FOIA and section 6(b)(1) of the CPSA, 15 U.S.C. § 2055(b)(1), and our regulations, 16 C.F.R. § 1101.32. FOIA Exemption 3 provides for the withholding from disclosure of matters that are specifically exempted from disclosure by another statute. In applying FOIA Exemption 3, we are relying on section 6(b)(1) of the CPSA. That section prohibits the Commission from disclosing information about a consumer product that identifies a manufacturer or private labeler unless the Commission has taken "reasonable steps" to assure that the information is accurate, that disclosure is fair in the circumstances, and that disclosure will be reasonably related to effectuating the purposes of the laws that the Commission

administers. In this case, we have sufficient information to call into question the accuracy of the information. Under these circumstances we must withhold the records. Specifically, we are withholding those portions that you indicated from pages 5, 6, 7, 8 and 9 of the file (or pages 2, 3, 4, 5 and 6 of the report).

Finally, we are withholding other records responsive to your request concerning K-Ceramics and Olympic Enterprises that are contained in the Commission's active law enforcement investigatory files pursuant to the FOIA Exemptions 5 and 7(A), 5 U.S.C. §§ 552(b)(5) and (b)(7)(A). Exemption 5 was explained above. Exemption 7(A) provides for the withholding from disclosure records or information compiled for law enforcement purposes, to the extent that the production of such law enforcement records or information could reasonably be expected to interfere with enforcement proceedings. The records being withheld consist of internal staff memoranda and correspondence containing recommendations, opinions, suggestions and analyses of the Commission's technical staff. The records constitute predecisional discussion that clearly falls within the deliberative privilege. Any factual materials in the records not covered by some other exemption are inextricably intertwined with exempt materials or the disclosure of the factual materials would itself expose the deliberative process. We have determined that the disclosure of these certain law enforcement investigatory records responsive to your request would be contrary to the public interest. It would not be in the public interest to disclose these materials because disclosure would (1) impair the frank exchange of views necessary with respect to such matters, and (2) prematurely reveal information used in the investigation, thereby interfering with this and other matters by disclosing the government's basis for pursuing these matters.

According to the Commission's regulations implementing the FOIA at 16 C.F.R. § 1015.7, a denial of access to records may be appealed to the General Counsel of the Commission within thirty (30) days of your receipt of this letter. An appeal must be in writing and addressed to: FOIA APPEAL, General Counsel, ATTN: Office of the Secretary, U.S. Consumer Product Safety Commission, Washington, D.C. 20207.

This completes the processing of your request. The cost to the Commission to perform the file searches and prepare this information was \$120.00. In this instance, we have decided to waive the charges.

Sincerely,

Todd A. Stevenson
Deputy Secretary and
Freedom of Information Officer
Office of the Secretary

Enclosures



U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D.C. 20207

July 22, 1997

CERTIFIED MAIL

Ms. Sherrell Duggan
3317 Beech Drive
Gretna, LA 70056

RE: FOIA Request S703056 (formerly S609020): Ceramic Glazing / Report 950907CWE7271 and related investigation reports and correspondence

Dear Ms. Duggan:

Thank you for your Freedom of Information Act (FOIA) request seeking information from the Commission. The records from the Commission files responsive to your request have been processed and copies of the releasable responsive records are enclosed. No records were located that identify Mayco or Mayco Colors products.

The enclosed records include file information generated by the Commission itself or its contractors for regulatory or enforcement purposes. These records are Establishment Inspection Reports and related documents pertaining to the inspections of Duncan Enterprises and Gare, Inc. The Commission has established management systems under which supervisors are responsible for reviewing the work of their employees or contractors. The file information materials are final and have been prepared and accepted by the Commission's staff under such review systems. The Commission believes that it has taken reasonable steps to assure the accuracy of the information.

The enclosed records include one Epidemiologic Investigation Reports with the underlying and supporting documentation. The Commission has received this information from its formal investigation systems. Through these systems the Commission hopes to learn when specific products are associated with illness, injury or death. The Commission believes that it has taken reasonable steps to assure the accuracy of this information. While conducting the interviews for the investigation report, Commission staff or contractors have spoken with the individuals involved in the incidents. Where possible, Commission staff have examined the products reportedly involved in the incident. Although the Commission has investigated the incident described in the investigation report, the Commission has not necessarily determined the cause of the incident.

Other portions of the files where one of the companies has requested confidentiality must be withheld pursuant to Exemptions 3 and 4 of the FOIA, 5 U.S.C. §§ 552(b)(3) and (b)(4), and section 6(a)(2) of the Consumer Product Safety Act (CPSA), 15 U.S.C. § 2055(a)(2). FOIA Exemption 3 provides for the withholding from disclosure of matters that are specifically exempted from disclosure by another statute. In applying FOIA Exemption 3 in this instance we are applying in part section 6(a)(2) of the CPSA. Section 6(a)(2) prohibits the Commission from disclosing information that is exempt from disclosure under Exemption 4 of the FOIA. That exemption protects trade secrets and confidential commercial information. Confidential commercial information is information directly related to a firm's business that the firm has not made public and whose disclosure could give a substantial commercial advantage to a competitor. Specifically, we are withholding portions or pages (14, 19, 20, 29 and 30) of the 9/29/95 report concerning Duncan Enterprises that if disclosed would reveal confidential and proprietary formulation data.

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Sincerely,

Todd A. Stevenson
Deputy Secretary and
Freedom of Information Officer
Office of the Secretary

Enclosures

950907CWE7271

DESCRIPTION OF RESPONDENTS

The respondent in this case is the complainant who contacted the New Orleans Resident Post and the HOTLINE.

PRE-ACCIDENT

The complainant made ceramic pottery as a hobby. She originally began making ceramic pottery in an apartment. Then in 1987 she and her family moved into a home. At that time she had 1 son who was born on 12/28/87.

The complainant said that the house her family moved into was built in the mid-1970's and that she was not the original occupant. She said that the house had been vacant for about 1 year prior to her family moving into it. She said that she did not notice any unusual smell in the house when her family moved in. She said that she painted the walls throughout the house after moving in. She did not have new carpeting put in the house.

She did her ceramic work in a shop which was located behind the house. The ceramic work involved firing the pottery in electric kilns. She had 3 kilns at that time.

The complainant said that in 1991 she moved the ceramic hobby, including the 3 electric kilns, into her house since she could no longer afford the shop in the back of the house. She set up the kilns in a room that was adjacent to the living area of the house. She said that there was a doorway between the room with the kilns and the living area of the house. She said that this door was always left open with a baby gate installed across the opened doorway. At that time she had the son that was born on 12/28/95 and another son born on 9/10/91.

The complainant said that she did not allow her children to go into the room where the kilns were located because she did not want them to break anything or get burned on the hot kilns.

She said that she used the electric kilns every day; sometimes twice a day. She said the firing process took approximately 8 hours from the time the firing process started until the kiln had cooled down and the ceramic pottery was removed.

The complainant said the ceramic pottery process included pouring the premade slip into a mold and allowing it to cure. The cured slip was then removed from the mold and the liquid ceramic glaze was then applied by either brushing on or dipping. The product was then placed in the kiln for firing. Decorative decals would also be applied to the product and the entire product would be fired in the kiln.

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The complainant said that during the firing process, there was always an odor given off from the kiln. The odors would be slightly different depending on whether or not decorative decals had been applied.

The complainant said that the kilns she used did not have hoods to vent any fumes. She said that the kilns did not have any warning labeling about fumes being given off during the firing process.

ACCIDENT

In June, 1993 the complainant's family began to have financial problems and went on Medicaid. In order to qualify for Medicaid the complainant's children had to undergo physical screenings. They were checked for lead poisoning during the screening process. At that time the children were ages 21 months and 5 years. The complainant was 5 months pregnant.

The complainant said that when her children were screened for lead poisoning, she had been out of the ceramic pottery hobby for about 1 year. Therefore, she had not fired any pottery for about 1 year prior to her children being screened for lead poisoning.

The screening for lead poisoning detected that both children had high levels of lead. The initial blood tests were fingerstick specimens.

The son born on 9/10/91 had fingerstick blood specimens collected on 6/25/93, 7/30/93 and 2/23/95. The lead levels for those tests were 41 UG/DL, 39 UG/DL and 20 MCG/DL, respectively. The 2/23/95 lead level of 20 UG/DL was after chelation treatment. Chelation is the treatment for reducing lead levels. Normal lead levels for a child should be less than 10 UG/DL. See the attached medical records(Exhibits 1-3). He also had venous blood collected on 6 occasions from 7/1/93 to 1/31/94 and the lead levels ranged from a low of 25 UG/DL to a high of 39 UG/DL. See the attached medical record(Exhibit #4).

The son born on 12/28/87 had fingerstick blood specimens collected on 6/30/93 and 7/30/93 with lead levels of 47 UG/DL and 104 UG/DL, respectively(Exhibits 5-6). He also had venous blood collected on 7 occasions from 7/7/93 to 1/31/94 and the lead levels ranged from a low of 20 UG/DL to a high of 48 UG/DL. See the attached medical record(Exhibit #7).

Both children were also given a DENVER II test which tests a child's behavior. According to medical personnel interviewed, the DENVER II test given on 6/30/93 to the child born on 12/28/93 was normal. See the attached record(Exhibit #8). The DENVER II test was given on 6/25/93 to the child born on 9/10/91. Medical personnel

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stated that this child had problems with the test the first and second times it was given to him but he was OK on the third time. See the attached record(Exhibit #9).

Upon questioning, the complainant stated that both of her sons mentioned above suffered from colic, hyperactivity, low iron levels and severe feeding problems(could not hold food down) from the time they were born. She does not know if these conditions were the result of lead poisoning.

The complainant also had blood tests done for lead levels. Tests were done on 6/27/93 and 6/30/93 with lead levels of 5.1 mcg/dl and 8.1 mcg/dl, respectively being reported. Normal ranges for lead in blood for adults - is 0-25 mcg/dl. See the attached medical records(Exhibits 10 and 11).

The complainant said that her husband did not have blood tests done for lead levels.

POST ACCIDENT

The complainant said that when she and her children had the physical screenings done for Medicaid, she had to fill out a questionnaire for the Center for Disease Control. She said the questionnaire asked about possible exposure to lead sources. She stated on the questionnaire that she made ceramic pottery. The questionnaire was reviewed by doctors that performed the blood test.

As a result of the high lead levels in the complainant's children's blood, the Louisiana Department of Health and Hospitals, Office of Public Health, Sanitarian Services was contacted to perform a lead survey in and around the complainant's house. The results are attached as Exhibit #12.

The tests concluded that the painted surfaces in the dwelling were lead-free but carpets in all rooms of the house contained lead most likely in the form of dust tracked in from the ceramics shop adjoining the house where lead glaze was used. The highest levels of lead were found in carpet which was infrequently vacuumed. The report further concluded that it was reasonable to assume that when the ceramics operation was in full swing, all heavy traffic areas(especially the den which was adjacent to the shop) was highly contaminated.

The doctor that reviewed the children's high lead levels recommended to the complainant that she determine if the ceramic products she was using was a source of the lead. The complainant stated that the doctor told her that the source of the lead was most probably the lead based ceramic glaze she was using in her

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ceramic operation.

The complainant contacted the slip manufacturer (Mackey Co., Laurel, MS) sometime in July, 1993 and she said they assured her that there was no lead in their product. The complainant explained that the slip is the material that is used to make the pottery.

The complainant also called the glaze manufacturer (Duncan Enterprises, 5673 E. Shield, Fresno, CA 93727, 209/291-4444). She explained to them that her two children had lead poisoning and she felt that it was from their lead glaze she was using in her ceramic making operation. She said that the individual she spoke with at Duncan said that she needed to look elsewhere for the source of the lead poisoning because their glaze is in a silicate form and children could not get lead poisoning from the glaze. He further told the complainant that Louisiana's environment, including the drinking water and air, are contaminated because of all the oil fields and chemical industry and that could be the source of the children's lead poisoning.

The complainant also mentioned to the Duncan representative that she thought the firing process in her kiln may be contributing to the lead poisoning of her children. She said that the Duncan representative told her that he felt the firing process would not cause lead fumes.

The Duncan representative told the complainant that as long as she was not spraying on the glaze there was no problems that could be associated with their glaze. The complainant said that she either brushes the glaze on the pottery or dips the pottery in the glaze prior to the firing process.

The complainant said that she was basing her concern that lead fumes were being given off by the ceramic glaze during the firing process because of literature she had obtained concerning the hazards of working with ceramics. Some of this literature is attached as Exhibits 13-15. The literature addresses the hazard of lead fumes being given off during the firing process in kilns.

The complainant also stated that she had read some literature by the U.S. OSHA that decorative decals that contained lead could also give off lead fumes during the firing process. She did not have this literature available during this IDI.

The complainant said that she had become concerned about lead being given off by the decorative decals during the firing process because her mother-in-law told her about labeling she read on some of the lead free glaze she used. The labeling on the lead free glaze the mother-in-law used instructed the user to retest the finished pottery for lead if decals had been fired on the pottery.

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The complainant did not have this instructive labeling during this IDI.

The complainant contacted the CPSC Hotline and the CPSC New Orleans Resident Post regarding her concern that the lead containing glazes and the decorative decals she used in her ceramic pottery making operation had caused her children's lead poisoning.

The complainant said that she purchased her decorative decals from K Ceramic Imports, 732 Ballough Rd., Daytona Beach, FL 32114, 904/252-6530. She said the labels are imported by K-Ceramic from Germany. Exhibit #17 is a copy of a portion of the latest K-Ceramic catalog.

She said that the labels she received from K-Ceramic did not have labeling on them indicating that they complied with ASTM D-4236. She said that her mother-in-law had contacted K-Ceramic by telephone in 8/95 requesting a MSDS (Material Safety Data Sheet) and expressed her concern that the decals and decal packaging did not contain the conformance statement ASTM D-4236.

The complainant said that her mother-in-law told her that the K-Ceramic representative she spoke with told her that the company legal advisor advised them not to put the conformance statement on the decal packaging because they would then be liable in any lawsuits.

The complainant said that sometime after she contacted the CPSC Hotline and New Orleans Resident Post, she again telephoned Duncan Enterprises and informed the same Duncan representative she had previously spoken with that she had filed a complaint with CPSC. The complainant said that this Duncan representative asked her what it was that she wanted from his company.

She told the Duncan representative that the labeling on the firm's glazes was not adequate. She told him that just stating that the product contained lead did not address the hazard. She believes that the label should also state that the lead in the glaze can cause lead poisoning. She said that the Duncan representative told her that if their label stated that the product could cause lead poisoning, his firm would go out of business because no one would purchase the product.

The complainant supplied the attached Duncan catalog (Exhibit #16). It was a 1988 catalog. Note on page 66 the labeling "For those of you who have occasion to teach ceramics in schools and institutions, and who must deal with the new legislation regarding art supplies, Duncan has developed a new line of nontoxic glazes. All Duncan nontoxic products are identified by the AP nontoxic seal of their labels. The AP Approved Product Seal of The Art and Craft

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Materials Institute, Inc. appears on the label of each jar of Duncan glaze, underglaze, nonfired color and accessory product which has been certified nontoxic."

During this IDI the complainant showed this investigator a jar of Duncan 1001 Clear Infinity Glaze which stated on it's label "NON TOXIC CONFORMS TO ASTM D-4236".

The complainant said that she plans on filing a lawsuit against Duncan Enterprises because she feels their glazes caused her children's lead poisoning.

She is the head of the Louisiana chapter of the United Parents Against Lead which consists of citizens concerned about the hazards of lead poisoning.

The complainant said that her two sons who are now ages 7 years and 4 years still suffer from lead poisoning. The 7 year old son has to attend a private school because he requires individual attention and he is dyslexic. The 4 year old still wears diapers, has constipation, diarrhea, tremors, and speech problems. The complainant said the 4 year old has pervasive developmental disorder.

PRODUCT IDENTIFICATION

The complainant said that the electric kilns she used during her ceramic operation were used ones. She said that they were manufactured by Blue Diamond Kiln Co., 2009 S. Hullen St., Metairie, LA and Duncan Enterprises, Fresno, CA.

The glazes used were predominantly manufactured by Duncan Enterprises, Fresno, Ca. However, she sometimes used glazes manufactured by Bell's Ceramic, New Orleans, LA which is now out of business, Mayco which she said is located in either California or Ohio and Gare Inc., 165 Rosemont St. , Haverhill, MA 01831.

The decorative decals she used were obtained from K-Ceramic Imports, 732 Ballough Rd., Daytona Beach, FL 32114 and Olympic Enterprises, Inc., 715 McCartney Rd., Youngstown, OH 44505.

STANDARDS INFORMATION

A jar of Duncan Enterprises glaze the complainant had on hand stated on it's label "NON TOXIC CONFORMS TO ASTM D-4236". The 1988 Duncan Enterprises catalog(Exhibit #16, page 66)indicates that all of their nontoxic glazes are approved by the Art and Craft Materials Institute, Inc.

ATTACHMENTS

950907CWE7271

- 1.Exhibit #1-Medical record #06259381700 dated 6/28/93
- 2.Exhibit #2-Medical record #07309381631 dated 8/1/93
- 3.Exhibit #3-Medical record #02239581252 dated 2/24/95
- 4.Exhibit #4-Medical record for 7/1/93-1/31/94
- 5.Exhibit #5-Medical record #06309381726 dated 7/2/93
- 6.Exhibit #6-Medical record #07309381630 dated 8/3/93
- 7.Exhibit #7-Medical record for 7/7/93-1/31/94
- 8.Exhibit #8-Medical record dated 6/30/93
- 9.Exhibit #9-Medical record dated 6/25/93
- 10.Exhibit #10-Medical record dated 8/31/93
- 11.Exhibit #11-Medical record dated 7/2/93
- 12.Exhibit #12-Lead Survey Data dated 8/30/93
- 13.Exhibit #13-Literature entitled "Health hazards of working with ceramics
- 14.Exhibit #14-Literature entitled "Ceramics"
- 15.Exhibit #15-Literature entitled "Children & Art Materials"
- 16.Exhibit #16-Duncan 1988 Product Reference Manual
- 17.Exhibit #17-K-Ceramic Imports partial catalog #18
- 18.Exhibit#18-CPSC Authorization For Release of Name dated 9/15/95
- 19.Exhibit #19-CPSC Consumer Product Incident Report #H9580059A
- 20.Exhibit #20-DSO assignment map dated 9/7/95

U. S. CONSUMER PRODUCT SAFETY COMMISSION

AUTHORIZATION FOR RELEASE OF NAME

Thank you for assisting us in collecting information on a potential product safety problem. The Consumer Product Safety Commission depends on concerned people to share product safety information with us. We maintain a record of this information, and use it to assist us in identifying and resolving product safety problems.

We routinely forward this information to manufacturers and private labelers to inform them of the involvement of their product in an accident situation. We also give the information to others requesting information about specific products. Manufacturers need the individual's name so that they can obtain additional information on the product or accident situation.

Would you please indicate on the bottom of this page whether you will allow us to disclose your name. If you request that your name remain confidential, we will of course, honor that request. After you have indicated your preference, please sign your name and date the document on the lines provided.

You are hereby authorized to disclose my name and address with the information collected on this case.

My identity is to remain confidential.


(Signature)

9/15/95
(Date)

CONSUMER PRODUCT INCIDENT REPORT

H9580059A

Narrative Continued

~~From ceramic glaze produced when firing ceramics in kiln had contaminated whole house; consumer had to evacuate house. Consumer feels that warning label on glaze should state fumes and dust produced by glaze during firing is harmful to children.~~

6/93 Consumer called and explained problem to manufacturer's customer service rep., (name unknown), who said lead in glaze is in a silicate form and could not have caused lead poisoning and offered no assistance.

6/93 Consumer called and explained problem again to manufacturer's customer service rep., (name unknown), and requested a material safety data sheet on glaze; manufacturer did this 7/93. Consumer found from data sheet that over exposure to lead in glaze through inhalation or ingestion can cause damage to kidneys, central nervous system, and developing fetus. Glaze comes in a hard plastic 40 oz. tube, and in a 1 gallon or 5 gallon hard plastic bucket.

Vict #	Sex	Age	Name	Relationship
2	M	3	Y [REDACTED]	son

Vict #	Victim Injury Description
2	see narrative

Distributor phone #: unknown

CPSC Source: WOM

13

950907cwE7271 EXHIBIT #2

SORATORY REPORT

W

98000000 AREA/ROUTE TOP: 6004999
MID WEST
ACTN: CAROL VIGNEE
1951 AMES BLVD #K
WARRERO, LA 70072



MICROFILM# 07309381631

PATIENT NAME ████████████████████		PATIENT ID 9-10-91		ROOM NO.	AGE 22	SEX M	PHYSICIAN WATTS/KIDMED	
PAGE 1	REQUISITION NO. 4991782	ACCESSION NO. 6878301	LAB REF. #	COLLECTION DATE & TIME 07/30/93 1015A	LOG-IN-DATE 07/30/93	REPORT DATE 08/01/93	& TIME 9:54PM	

REMARKS

REPORT STATUS	TEST	RESULT		UNITS	REFERENCE RANGE	SITE CODE
		IN RANGE	OUT OF RANGE			

FINAL	LEAD BLOOD LEAD (B)	39 H		UG/DL		SL
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REFERENCE RANGE

 CHILDREN UNDER 6 YEARS: <10
 ADULTS AND CHILDREN OVER 6 YEARS: <25

REFERENCE RANGE APPLIES TO NON-EXPOSED INDIVIDUALS.

PEDIATRIC REFERENCE RANGE IS BASED UPON THE GUIDELINES PUBLISHED IN "PREVENTING LEAD POISONING IN YOUNG CHILDREN", CENTERS FOR DISEASE CONTROL, DHHS, OCTOBER, 1991.

ACCEPTABLE BLOOD LEVELS IN OCCUPATIONALLY EXPOSED INDIVIDUALS VARY WITH CONDITIONS OF EXPOSURE AS DEFINED BY CURRENT FEDERAL REGULATIONS.

THE SPECIMEN OF CHOICE IS VENOUS BLOOD COLLECTED IN A BROWN OR VIOLET BLUE HEPARINIZED TRADE METAL TUBE.

IF THIS IS A FINGERSTICK SPECIMEN, PLEASE NOTE THAT FALSE ELEVATIONS CAN OCCUR DUE TO SKIN CONTAMINATION WITH LEAD. IT IS RECOMMENDED THAT ELEVATED LEVELS BE CONFIRMED USING A VENIPUNCTURE SPECIMEN.

^^ END OF REPORT ^^

RECEIVED AUG 2 1993

M

950907CW67271

EXHIBIT #3

LABORATORY REPORT

W.

98009000 AREA/ROUTE/ JP: 6007999
KID MED WEST
ATTN: CAROL VIGNES
1751 AMES BLVD #K
MARRERO, LA 70072



MICROFILM# 02239581252

PATIENT NAME		PATIENT ID		ROOM NO.	AGE	SEX	PHYSICIAN
[REDACTED]		9-10-91			3	M	DR WATTS
PAGE	REQUISITION NO.	ACCESSION NO.	LAB REF. #	COLLECTION DATE & TIME	LOG-IN-DATE	REPORT DATE	& TIME
1	7349580	955952J		02/23/95 910A	02/23/95	02/24/95	11:35AM

REMARKS

CENTRAL TIME

REPORT STATUS	FINAL	TEST	RESULT		UNITS	REFERENCE RANGE	SITE CODE
			IN RANGE	OUT OF RANGE			

LEAD, BLOOD 20 H MOG/DL AT

RESULT MAY BE ELEVATED DUE TO UNKNOWN CONTAMINANTS; PLEASE RECOLLECT AND RESUBMIT FOR VERIFICATION.

REFERENCE RANGE APPLIES TO NON-EXPOSED INDIVIDUALS. ACCEPTABLE BLOOD LEAD LEVELS VARY WITH CONDITIONS OF EXPOSURE AS DEFINED BY CURRENT FEDERAL REGULATIONS.

REFERENCE RANGE:

CHILDREN UNDER 6YRS: LESS THAN 10 MOG/DL
CDC CLASS* BLOOD LEAD CONCENTRATION MOG/DL

- I LESS THAN OR EQUAL TO 9
- II A 10-14
- II B 15-19
- III 20-44
- IV 45-69
- V GREATER OR EQUAL TO 70

REFER TO CURRENT CDC GUIDELINES FOR COMMENTS AND INTERVENTIONS RECOMMENDED FOR EACH CLASS.

ADULTS AND CHILDREN (6YRS OF AGE OR OLDER)
LESS THAN 25 MOG/DL

>> END OF REPORT <<

RECEIVED FEB 24 1995

15

950907cu#727)

EXHIBIT #5

LABORATORY REPORT

W

98009000 AREA/ROUTE/STOP: 8053000
KID WEST
ATTN: CAROL VIGNES
1951 AMES BLVD #K
MARRERO, LA 70072



MICROFILM# 06309381726

PATIENT NAME [REDACTED]		PATIENT ID 12-28-87	ROOM NO.	AGE	SEX E M	PHYSICIAN KIDNED/WATTS
PAGE 1	REQUISITION NO. 4576357	ACCESSION NO. 624347I	LAB REF. #	COLLECTION DATE & TIME 06/30/93 4:10PM	LOG-IN-DATE 06/30/93	REPORT DATE & TIME 07/02/93 1:25AM

REMARKS

REPORT STATUS	TEST	RESULT	UNITS	REFERENCE RANGE	SITE CODE
		IN RANGE	OUT OF RANGE		

LEAD, BLOOD					SL
LEAD (B)		47 H	UG/DL		
RESULT VERIFIED BY REPEAT DETERMINATION.					

REFERENCE RANGE

 CHILDREN UNDER 6 YEARS: <10
 ADULTS AND CHILDREN OVER 6 YEARS: <25

REFERENCE RANGE APPLIES TO NON-EXPOSED INDIVIDUALS.

PEDIATRIC REFERENCE RANGE IS BASED UPON THE GUIDELINES PUBLISHED IN "PREVENTING LEAD POISONING IN YOUNG CHILDREN", CENTERS FOR DISEASE CONTROL, DHHS, OCTOBER, 1991.

ACCEPTABLE BLOOD LEVELS IN OCCUPATIONALLY EXPOSED INDIVIDUALS VARY WITH CONDITIONS OF EXPOSURE AS DEFINED BY CURRENT FEDERAL REGULATIONS.

THE SPECIMEN OF CHOICE IS VENOUS BLOOD COLLECTED IN A BROWN OR ROYAL BLUE HEPARINIZED TRACE METAL TUBE.

IF THIS IS A FINGERSTICK SPECIMEN, PLEASE NOTE THAT FALSE ELEVATIONS CAN OCCUR DUE TO SKIN CONTAMINATION WITH LEAD. IT IS RECOMMENDED THAT ELEVATED LEVELS BE CONFIRMED USING A VENIPUNCTURE SPECIMEN.

<< END OF REPORT >>

RECEIVED JUL 2 1993

17

950907CW E7271

EXHIBIT #6

BORATORY REPORT

W

98009000 AREA/ROUTE. LTOP: 6007999
KID WEST
ATTN: CAROL VIGNES
1951 AMES BLVD #K
MARRERO, LA 70072



MICROFILM# 07309381A30

PATIENT NAME		PATIENT ID		ROOM NO.	AGE	SEX	PHYSICIAN
[REDACTED]		12-28-87				F M	WATTS/KIDMED
PAGE	REQUISITION NO.	ACCESSION NO.	LAB REF. #	COLLECTION DATE & TIME	LOG-IN-DATE	REPORT DATE	& TIME
1	4791781	6878331		07/30/93 1020A	07/30/93	08/03/93	4:01AM

REMARKS

REPORT STATUS	TEST	RESULT		UNITS	REFERENCE RANGE	SITE CODE
		IN RANGE	OUT OF RANGE			

LEAD, BLOOD						SL
LEAD (B)		104 H		UG/DL		
RESULT VERIFIED BY REPEAT DETERMINATION.						

REFERENCE RANGE

CHILDREN UNDER 6 YEARS: <10
ADULTS AND CHILDREN OVER 6 YEARS: <25

REFERENCE RANGE APPLIES TO NON-EXPOSED INDIVIDUALS.

PEDIATRIC REFERENCE RANGE IS BASED UPON THE GUIDELINES PUBLISHED IN "PREVENTING LEAD POISONING IN YOUNG CHILDREN", CENTERS FOR DISEASE CONTROL, DHHS, OCTOBER, 1991.

ACCEPTABLE BLOOD LEVELS IN OCCUPATIONALLY EXPOSED INDIVIDUALS VARY WITH CONDITIONS OF EXPOSURE AS DEFINED BY CURRENT FEDERAL REGULATIONS.

THE SPECIMEN OF CHOICE IS VENOUS BLOOD COLLECTED IN A BROWN OR ROYAL BLUE HEPARINIZED TRACE METAL TUBE.

IF THIS IS A FINGERSTICK SPECIMEN, PLEASE NOTE THAT FALSE ELEVATIONS CAN OCCUR DUE TO SKIN CONTAMINATION WITH LEAD. IT IS RECOMMENDED THAT ELEVATED LEVELS BE CONFIRMED USING A VENIPUNCTURE SPECIMEN.

>> END OF REPORT <<

RECEIVED AUG 03 1993

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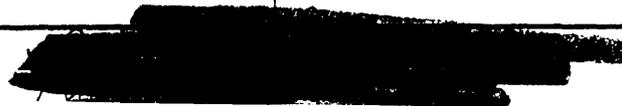
MISCELLANEOUS

DATE	SPECIMEN	EXAMINATION	RESULT
7/25/88	Blood Cnl.		Negative
7/25/88	Stool Cnl.		Negative
7/25/88		occ. Blood	neg
NOV. 1 1990		Q/Prep	pos
7/7/93	Venous Blng	Lead level	48 UG / DL
8/4/93	Venous Blng	Lead level	45 UG / DL
9/1/93	Venous Blng	Lead level	48 UG / DL
9/12/93	Venous Blng	Lead level	20 UG / DL
9/27/93	Venous Blng	Lead level	22 UG / DL
10/26/93	Venous Blng	Lead level	40 UG / DL
1/31/94	Venous Blng	Lead level	38 UG / DL

19

WESTSIDE PEDIATRIC CLINIC
4520 WICHERS DR., STE. #103
MARRERO, LA. 70072

12/28/87



Examiner: *K Cr. & I-*
 Date: *10-25-93*

950907 CW E 7271 EXHIBIT #9
 Birthdate: *9/1/20* 2-3-20
 ID No.: 0-7 YEARS 4 2-0-3

MONTHS 2 4 6 9 12 15 18 24 3 4 5 6

PERSONAL - SOCIAL

FINE MOTOR - ADAPTIVE

Percent of children passing
 25 50 75 90

May pass by report = TEST ITEM
 Footnote no (See back of form)

13-9-13
9-9-10
2-0-3

43-17-30
41-9-10
2-3-20

43-9-13
1-20-93

BRUSH TEETH WITH HELP
 FEED EXCEL
 REMOVE CRUMBS
 USE SPOON/FORK
 HELP IN HOUSE
 DRINK FROM CUP
 IMITATE ACTIVITIES
 PLAY BALL WITH EXAMINER
 WAVE BYE-BYE
 INDICATE WANTS
 PLAY PAT-A-CAKE
 FEED SELF
 WORK FOR TOY
 REGARD OWN HAND
 SMILE SPONTANEOUSLY
 SMILE RESPONSIVELY
 REGARD
 TAKE 2 CUBES
 PASS CUBE
 RAKE RAISIN
 LOOK FOR YARN
 REACHES
 REGARD RAISIN
 FOLLOW 180°
 HANDS TOGETHER
 GRASP RATTLE
 FOLLOW PAST MIDLINE
 FOLLOW TO MIDLINE
 DADA/MAMA SPECIFIC
 JABBERS
 COMBINE SYLLABLES
 DADA/MAMA NON-SPECIFIC
 IMITATE SPEECH SOUNDS
 SINGLE SYLLABLES
 TURN TO VOICE
 TURN TO RATTLING SOUND
 SQUEALS
 LAUGHS
 "OOO/AHH"
 VOCALIZES
 RESPOND TO BELL
 PULL TO SIT - NO HEAD-LAG
 ROLL OVER
 CHEST UP-ARM SUPPORT
 BEAR WEIGHT ON LEGS
 SIT-HEAD STEADY
 HEAD UP 90
 HEAD UP 45°
 LIFT HEAD
 EQUAL MOVEMENTS

BRUSH TEETH WITH HELP
 FEED EXCEL
 REMOVE CRUMBS
 USE SPOON/FORK
 HELP IN HOUSE
 DRINK FROM CUP
 IMITATE ACTIVITIES
 PLAY BALL WITH EXAMINER
 WAVE BYE-BYE
 INDICATE WANTS
 PLAY PAT-A-CAKE
 FEED SELF
 WORK FOR TOY
 REGARD OWN HAND
 SMILE SPONTANEOUSLY
 SMILE RESPONSIVELY
 REGARD
 TAKE 2 CUBES
 PASS CUBE
 RAKE RAISIN
 LOOK FOR YARN
 REACHES
 REGARD RAISIN
 FOLLOW 180°
 HANDS TOGETHER
 GRASP RATTLE
 FOLLOW PAST MIDLINE
 FOLLOW TO MIDLINE
 DADA/MAMA SPECIFIC
 JABBERS
 COMBINE SYLLABLES
 DADA/MAMA NON-SPECIFIC
 IMITATE SPEECH SOUNDS
 SINGLE SYLLABLES
 TURN TO VOICE
 TURN TO RATTLING SOUND
 SQUEALS
 LAUGHS
 "OOO/AHH"
 VOCALIZES
 RESPOND TO BELL
 PULL TO SIT - NO HEAD-LAG
 ROLL OVER
 CHEST UP-ARM SUPPORT
 BEAR WEIGHT ON LEGS
 SIT-HEAD STEADY
 HEAD UP 90
 HEAD UP 45°
 LIFT HEAD
 EQUAL MOVEMENTS

PREPARE CEREAL
 BRUSH TEETH, NO HELP
 PLAY BOARD/CARD GAMES
 DRESS, NO HELP
 PUT ON T-SHIRT
 NAME FRIEND
 DRAW PERSON 8 PARTS
 COPY □ DEMONSTR.
 PICK LONGER LINE
 COPY +
 DRAW PERSON 3 PTS
 COPY ○
 THUMB WIGGLE
 DEFINE 7 WORDS
 OPPOSITES-2
 COUNT 5 BLOCKS
 KNOW 3 ADJECTIVES
 DEFINE 5 WORDS
 NAME 4 COLORS
 UNDERSTAND 4 PREPOSITIONS
 EECH UNDERSTANDABLE
 KNOW 4 ACTIONS
 USE OF 3 OBJECTS
 COUNT 1 BLOCK
 USE OF 2 OBJECTS
 NAME 1 COLOR
 KNOW 2 ADJECTIVES
 KNOW 2 ACTIONS
 NAME PICTURES
 BALANCE EACH FOOT 6 SECONDS
 HEEL-TO-TOE WALK
 BALANCE EACH FOOT 5 SECS.
 BALANCE EACH FOOT 4 SECS.
 BALANCE EACH FOOT 3 SECONDS
 HOPS
 BALANCE EACH FOOT 2 SECONDS
 BALANCE EACH FOOT 1 SECOND
 BRIGAD JUMP

TEST BEHAVIOR

Check boxes for 1st, 2nd, or 3rd test)

Typical
 Yes 1 2 3
 No

Compliance (See Note 31)
 Always Complies 1 2 3
 Usually Complies
 Rarely Complies

Interest in Surroundings
 Alert 1 2 3
 Somewhat Disinterested
 Seriously Disinterested

Fearfulness
 None 1 2 3
 Mild
 Extreme

Attention Span
 Appropriate 1 2 3
 Somewhat Distractable
 Very Distractable

950907CWE7271

EXHIBIT # 10

Me Vest
 Clinical Laboratories
 214-827-4970
 4 WORTH STREET METRO 214-263-8964
 DALLAS, TEXAS 75246 WATS 800-444-4849

CAB NUMBER
 PATIENT
 AGE
 SEX
 I.C. OR ROOM NO.
 REPORT STATUS
 DATE REPORTED
 DATE/TIME COLL.
 DATE RECEIVED
 ACCOUNT
 REQ. PHYSICIAN
 FASTING

01524284-2 NEW

23Y
F

Dr. Maria Lopez, M.D.
 (111) Medical Center
 12011 4501
 Dallas, TX 75242-6000

Test Name	In Range/Interp	Unit of Range	Reference	Units
Lead, Blood	5.1		0-25.0 mcg/dl	

Normal ranges for Lead in blood:
 Adults: 0-25 mcg/dl
 Children: 0-10 mcg/dl

Performing Locations:
 MeVestPath-Teterboro
 One Malcolm Avenue, Teterboro, NJ, 07608-1079
 Medicare: CLIA: 31DE608246, CNP:
 Tests Ordered: Collection Fee, Blood: Lead, Blood
 End of Report
 01524284-2

22

950907CWET271
EXHIBIT #11

214-827-4970
METRO 214-263-8964
WATS 800-444-4849

214-827-4970
METRO 214-263-8964
WATS 800-444-4849

PATIENT
AGE 28Y
SEX F

☐ Maria Cortez, M.D.
1111 Medical Center
Blvd., #501
Marrero, LA 70072-0000

I.D. OR ROOM NO.
REPORT STATUS Final Report
DATE REPORTED 07/02/93, 01:46 PM
DATE/TIME COLL 06/30/93, 03:10 PM
DATE RECEIVED 06/30/93, 03:10 PM
ACCOUNT 6069
REQ. PHYSICIAN

PAGE 1

FASTING No

Result Name	In Range/Interp	Out of Range	Reference	Units	FN
Lead	8.1		0-25.0	ug/dL	mp

OSHA Action Limit for adult patients is 40 ug/dL.
Normal ranges for Lead in blood:
Adults: 0-25 mcg/dl
Children: 0-15 mcg/dl

WNL
July 6-93

Performing Locations

mp MetPath-Teterboro
One Malcolm Avenue, Teterboro, NJ, 07608-1070
Medicare: CLIA: 31D0696246, CAP:

Tests Ordered: Lead, Blood; Collection Fee, Blood

End of Report: (04006396-2)

Report given 7-6-93
(PM)

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LEAD SURVEY DATA

TE ADDRESS: 3945 Hindmere St. Harvey, LA
LD'S NAME: [REDACTED]

TE OF SURVEY: 8/30/93 PARISH: Jefferson SANITARIAN: F. Allo and C. Anderson

ID#	Room/Component	Sample#	K-Shell mg/cm ²	L-Shell mg/cm ²	Pb-Soil ppm	Time seconds	Date	ID cell format
03309326062401	validation check	1	0.9	1.7	0	80	0	08309326 062401
08309326062607	"	2	1.2	1.7	0	80	0	08309326 062401
08339326062401	"	3	1.1	1.7	0	80	0	08309326 062401
0101	Foyer/wall	1	0.2	0.0	0	20	0	0101
0101	" /floor	2	0.0	0.0	0	20	0	0101
0102	LR/wall	1	0.0	0.0	0	20	0	0102
0102	LR/carpet	2	0	0	8476	20	0	0102
0102	LR/carpet	3	0	0	11383	20	0	0102
1003	Kit/wall	1	0.0	0.0	0	20	0	1003
0102	LR/carpet	1	2.9	0.8	0	80	0	0102
0102	LR/carpet	2	3.0	1.4	0	80	0	0102
0102	LR/dusty furniture	3	0.0	0.0	0	80	0	0102
0105	invalid reading	1	0	0	0	20	0	0105
0105	Den, sofa	2	0	0	6939	20	0	0105
0105	"	3	0	0	6589	20	0	0105
0105	Den/carpet	4	0	0	5845	20	0	0105
0105	"	5	0	0	5966	20	0	0105
0105	"	6	0	0	5810	20	0	0105
0105	"	7	3.6	0	9331	20	0	0105
0105	"	8	2.1	0.9	0	20	0	0105
0105	"	9	2.1	0.8	6085	80	0	0105
0104	shop/glaze pan	1	10.1	5.5	26992	20	0	0104
0104	shop/floor	2	0.0	0.0	3209	20	0	0104
0107	MasterBR/carpet	1	3.5	8.1	28317	20	0	0107
0108	JordanBR/ "	1	1.9	1.4	7709	20	0	0108
0109	SpereBR/ "	1	2.5	1.7	8784	20	0	0109
0110	RichardBR/ "	1	2.4	3.0	11582	20	0	0110
0113	Hall/carpet	1	2.6	2.7	11185	20	0	0113
0113	"	2	3.3	2.0	9477	20	0	0113
0114	LR/carpet	3	2.1	1.1	6795	20	0	0114
0114	Richard's mattress	1	0.2	0.0	5175	20	0	0114
0114	"	2	0.5	0.2	6961	20	0	0114

CONCLUSIONS: Painted surfaces in the dwelling are lead-free. Carpets in all rooms of the house contain lead most likely in the form of dust tracked in from the ceramics shop adjoining the house where lead glaze is used. The highest levels of lead were found in carpet which is infrequently vacuumed, but it is reasonable to assume that when the ceramics operation was in full swing, all heavy traffic areas (especially the den which is adjacent to the shop) were highly contaminated.

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ART HAZARDS PROJECT

Children & Art Materials

By Michael McCann, Ph.D., and
Monona Rossol, M.S., M.F.A.

Despite the concern over lead poisoning in children and attempts to eliminate children's exposure to such lead-containing materials as wall paints and pencils, many children are still being exposed to lead in art classes in schools, community centers and even the home. One of the authors (M.R.), for example, has observed situations in which children were using raw lead glazes, lead frits and lead enamels.

Many people mistakenly assume that lead frits are "safe," whereas in actuality many commercial lead frits can dissolve in stomach acids. Other sources of lead in art materials sometimes used with children include silkscreen and other printmaking inks, lead solders and stained glass. Recent examples of lead poisoning in children include a child swallowing stencil paint which upon analysis was found to contain at least 30 percent lead, and a four-year old boy developing lead poisoning after being present in the kitchen where his parents were involved in stained glass work. One of the problems is that these materials usually do not state that they contain lead nor do they carry warning labels.

Lead, however, isn't the only hazardous art material being used by children. For example, ingestion of one tablespoon of turpentine can be fatal to a child, and ingestion of two teaspoons of methyl alcohol (found in many shellacs) could have serious toxic effects, possibly including blindness. Other art materials that are toxic by single or repeated ingestions of small amounts include many solvents (paint thinner, kerosene, lacquer thinners, etc.), acids, alkalis, photographic chemicals, dyes and many pottery glaze ingredients.

Ingestion, however, is not the only way in which art materials can injure children. Skin contact with many art materials can cause burns, irritation, ulcers and allergies. Examples include solvents which defat the skin, acids and alkalis which can cause severe burns, formaldehyde and turpentine which can cause skin allergies, and potassium dichromate (a natural dye mordant) which can cause skin and nose ulcers. If the skin has cuts or sores, then many toxic materials can enter the body through these breaks in the skin's defenses. In addition, many solvents can be absorbed through the skin into the body.

Finally, inhalation of solvent vapors, dusts, aerosol spray mists and metal fumes can either injure the lungs or be absorbed through the lungs into the bloodstream. Common art materials containing hazardous solvents include turpentine, paint thinner, paint and varnish removers, rubber cement, silk screen inks and solvents, lacquers and their thinners, shellac, permanent markers, cleaning solvents, aerosol spray cans and solvent-based glues and

adhesives. Hazardous dusts include asbestos, dry clay, glaze ingredients, dye powders, tempera powders, plaster dust and sawdust. Other toxic art materials children may be exposed to include etching gases, kiln gases, soldering fumes, and gases from photographic developing.

What is the risk?

We believe that children under the age of about 12 should not be exposed to most hazardous materials. This conclusion is based on both physiological and psychological reasons.

First, children are at much higher risk physiologically than adults from exposure to toxic materials. There are several reasons for this. Children and teenagers are still growing and have a more rapid metabolism than adults. As a result they are more likely to absorb toxic materials into their bodies. With young children this can especially affect the brain and nervous system. Young children also have incompletely developed lungs and body defenses, and are therefore particularly more susceptible to inhalation hazards. Finally, children are at higher risk because of their smaller body weight. A certain amount of toxic material is more concentrated in a child's body than it is in a larger adult body. Therefore, the smaller the child, the greater the risk.

Second, children under the age of 12 cannot be depended upon to either understand the need to carry out precautions or to effectively carry them out on a consistent basis. Preschool children are likely to deliberately put things in their mouth and swallow them, thus creating an even greater hazard. Even though older children might not deliberately swallow art materials, there have been several fatalities due to accidentally allowing turpentine or paint thinner that had been carelessly stored in soda bottles, orange juice containers of similar containers. In addition accidental ingestion can occur by placing contaminated hands in the mouth.

For these reasons, we recommend that children under the age of 12 not be allowed to use art materials that are hazardous by ingestion, skin contact or inhalation. Junior and senior high school students, although that are still at higher risk than adults, are at an age where they might normally be expected to understand the need for precautions and to consistently carry out precautions. Of course this generalization has exceptions, particularly with retarded or rebellious students. However, we would still recommend that even junior and senior high school students should not use highly toxic materials, like asbestos, lead, mercury and cadmium, since even small exposures to these materials can

Many art materials recommended in children's art books are highly toxic and should not be used by children. For example, one state curriculum guide for art in elementary schools recommends the use of benzene and carbon tetrachloride — both extremely toxic solvents — for clean-up, and also contains a recipe for a clay substitute that calls for "three cups of ground asbestos." The use of these materials is even hazardous to the teachers.

This brings up the question of how can you tell which art materials are safe or how can children work with them safely? Many children's art materials have a label stating they are "non-toxic." Unfortunately this label can be misleading since many children's art materials have not been tested for long term toxicity, including possible cancer. Further most art material manufacturers do not have toxicologists or other personnel competent to evaluate the hazards of the materials they are using. The only program we know of which has attempted to ensure the safety of children's art materials is that of the Crayon, Watercolor and Craft Institute. Art materials carrying their Certified Product (CP) or Approved Product (AP) seal of approval have been certified by an authority on toxicology, associated with a leading university, to contain no materials in sufficient quantities to be toxic or injurious to the body, even if ingested.

The following are some recommendations for the use of art materials with children:

- Do not allow children to use adult art materials containing toxic solvents, glues, metals, acids, alkalis, etc.
- Use water-based art materials such as water-based inks, paints, and glues. Make sure that print-making inks, paints, etc. do not contain lead, chromium, cadmium or other toxic pigments. Do not use epoxy, instant glues or solvent-based adhesives such as rubber cement.
- Some art techniques can be used with children if hazardous steps are done by the teacher when children are not present. For examples, the mixing of clay, plaster and other powders with water, spray fixing drawings and clean-up with hazardous solvents should be done by the teachers.
- Clean the art area carefully so that toxic dusts such as clay, plaster, etc., do not accumulate where they can be inhaled by children (or teacher!).
- Do not allow food or drink in the art area because of the risk of contamination and make sure children wash their hands carefully after class. Make sure children do not have exposed cuts or sores on their hands.
- Ventilate all kilns including electric

■ Precautions For Elementary And Secondary Art Teachers

By *Ida herma Williams*

Art Hazards **Chairman**

Philadelphia Chapter, **Artists Equity Association**

We are concerned that some art materials may be threatening the health of elementary and secondary school children. Since children have a greater susceptibility to toxic materials than adults, we must be very careful. Many materials with a non-toxic label may contain toxic materials. Products with the Cation, Watercolor and Craft institute CP (certified product) or AP (approved product) seal are probably safer than products without this seal, especially in terms of immediate poisoning.

Children can absorb toxic materials into their bodies by the inhalation of dusts, sprays or solvent vapors. These toxic materials can affect the respiratory system causing lung cancer, asthma or emphysema. Other ways to absorb materials are through ingestion, for example children putting colored pencils and paint brushes in their mouth, or through cuts and infections in the skin. The art room should be kept very clean and should have good ventilation with a constant supply of fresh air. The accompanying table lists art materials which should not be used with children

under 12 years old, along with possible substitutes.

Children over 12 should only be allowed to use more advanced techniques if the proper precautions are taken.

1. Teach the students the hazards and precautions of art materials.
2. Have good ventilation in the art room with a constant supply of fresh air.
3. Wear proper protective clothing, aprons, gloves, and goggles.
4. Clean the work area during and after use of art materials.
5. Store solvents in their own containers (not in food containers or soda bottles). Label all materials carefully.
6. Do not grind toxic pigments. Use prepared paints only.
7. When using power equipment, inspect cords and plugs. Make sure the equipment is properly grounded.
8. Do not use lead glazes or lead frits. Many non-lead glazes are available.
9. Fumes and gases from all kilns are dangerous. Kilns should have proper ventilation.

This is an incomplete list. As more information is available, we shall keep people informed with supplementary lists.

Art Materials That Children Under 12 Should Not Use

1. Clay in dry form. The dry powder contains silica which is easily inhaled and may cause silicosis.
2. Glazes or frits that contain lead.
3. Solvents (e.g., turpentine, benzene, toluene, rubber cement and its thinner)
4. Cold water dyes or commercial dyes.
5. Permanent markers which may contain toluene or other toxic solvents.
6. Some instant paper mashes may contain asbestos fibers or lead from pigments in colored printing inks.
7. Aerosol sprays.
8. Powdered tempera' colors. (Their dusts may contain toxic pigments).
9. Arsenic, cadmium, chrome, mercury, lead or manganese pigments.
10. Pastels that create dust.
11. All photographic-chemicals.
12. Lead solder and stained glass.
13. Epoxy instant glues or other solvent-based glues.
14. Solvent-based silk screen and other printing inks.
15. Silica sand for moulds.

Substitutes

1. Clay is safe in wet form only (wet clay cannot be inhaled).
2. Use poster paints instead of glazes.
3. Use water-based paints and other materials.
4. Use vegetable dyes, onionskins, etc.
5. Use only water-based markers.
6. Make paper mache from black and white newspaper or library or white paste.
7. Use brushes and water-based paints in splatter techniques.
8. Use only liquid colors or the teacher can pre-mix the pigment.
9. More adequate labelling is needed on art materials to know which colors are safe to use.
10. Use crayons or erasables which are oil-based.
11. Use blueprint paper and make sun grams.
12. Use colored cellophane and black paper to simulate lead.
13. Use water-based white glue or library paste.
14. Use paper stencils and water-based inks.
15. Use olivine sand.

Artists' organizations, art schools or artists' publications wishing to reprint articles or data sheets should address such requests to: **Monona** Rossol, Director, Art Hazards Information Center, 5 Beekman Street, New York, NY 10038.

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Center for Safety in the Arts

5 Beekman Street, New York, New York 10038 Area 212/227-6220

CERAMICS

By Michael McCann, Ph.D, C.I.H.

Ceramic art and pottery has a wide variety of hazards. The specific hazards and precautions can be divided into four areas: 1) working with **clay**; 2) **glazing** and coloring; 3) firing in a kiln; and 4) potential leaching of finished ware.

Clay

Clays are minerals composed of hydrated aluminum silicates, often containing large amounts of crystalline silica. Other impurities may include organic matter or sulfur compounds. Sometimes, grog (ground firebrick), sand, talc, vermiculite, perlite, and small amounts of minerals such as barium carbonate and metal oxides, are added to modify clay properties. Clays can be worked by hand or on the potter's wheel, or cast in a clay slurry into molds.

Clay is made by mixing dry clay with water in a clay mixer. Clay slip is made by adding talcs which themselves can be contaminated with fibrous asbestos or asbestos-like materials. Geographical sources of talcs are relevant, for example, New York State talcs are notoriously asbestos-contaminated, while Vermont talcs are not. Pfizer has some fiber-free talcs

Hazards

1. There have been known cases of silicosis, or "potter's rot," from chronic inhalation of large amounts of **free** silica during clay mixing. Symptoms of silicosis include: shortness of breath, dry cough emphysema, and high susceptibility to lung infections such as tuberculosis. The disease may take years to develop. Silica dust exposure is not hazardous by skin contact or ingestion.
2. Chronic inhalation of **kaolin** is moderately hazardous, and can result in kaolinosis, a disease in which the lungs become mechanically clogged.
3. Asbestos is extremely toxic by inhalation and possibly by ingestion. Asbestos inhalation may cause asbestosis, lung cancer, mesothelioma, stomach cancer, and intestinal cancer.
4. Sand, perlite, grog, and vermiculite contain free silica and are, therefore, highly toxic by inhalation. Vermiculite is also frequently contaminated with asbestos.
5. There is a danger of accidents if clay or water can be added while the mixer is in operation.
6. **Bags of clay** and glaze materials can be very heavy, and lifting can cause back problems.

* This data sheet is adapted from the ceramics chapter of Dr. McCann's 2nd edition of *Artist Beware*.

7. Hypersensitivity pneumonia, asthma, or other respiratory problems may occur with exposure to molds growing in wet clay that is being soured or aged in a damp place, in slips that stand for months, or with inhalation of dry aged clay. Molds can cause or exacerbate skin problems and change the workability of day.

8. Throwing on a potter's wheel for long periods of time can result in **carpel** tunnel syndrome because of the awkward position of the wrists. Pain numbness and/or pins and needles in the thumb and first three fingers, are common symptoms. Back problems can occur from bending over the potter's wheel for long periods of time.

9. Hand contact with wet clay can result in abrasion and dryness of fingertips and hands.

10. Moving parts of kickwheels can cause cuts and abrasions. This can be especially a problem with young children.

11. Clay scraps on the floor, bench and other surfaces can dry and pulverize, producing an inhalation hazard due to the presence of **free** silica. Similarly, reconditioning clay by pulverization and sanding finished green ware, can create very high concentrations of hazardous silica dust.

Precautions

1. Use premixed clay to avoid exposure to large quantities of clay dust.
2. Clay storage and mixing should take place in a separate room. Bags of clay (and other pottery materials) should be stacked on palettes or grids off the floor for easier clean-up.
3. All clay mixers should be equipped with local exhaust ventilation to remove **fine** silica dust particles from the air. If the local exhaust system is not totally effective, wear a NIOSH-approved toxic dust respirator.
4. Clay mixers should be equipped with proper machine guards so that they cannot be opened to add clay or water while the mixer blades are turning.
5. Wear separate work clothes while in the studio. Choose clothes of material and design that don't trap dust. Wash these clothes **weekly**, and separately from other laundry.
6. Do not use asbestos or asbestos-contaminated talcs.
7. Avoid contact of clay with broken skin. Use a skin moisturizer.
8. To prevent back problems, always lift with knees bent. Also, use a **standup** wheel (Cranbrook style treadle wheel), or elevate electric wheels to a height that doesn't require

bending over. Exercise and massage may relieve minor muscular pain.

9. Keep wrists in unflexed position as much as possible to prevent **carpel** tunnel syndrome. Take frequent work breaks.

10. Be **careful** of the moving parts on kickwheels, and do not allow young children to use kick style potters wheels.

11. Recondition clay by cutting still-wet clay into small pieces, letting them air-dry, and soak in water.

12. Finish green ware while still wet or damp with a fine sponge instead of sanding when dry. Always wear a NIOSH approved toxic dust respirator if sanding dry ware. Do not sand greenware containing fibrous talc.

13. Wet mop floors and work surfaces **daily** to minimize dust levels and prevent **dry** scraps from becoming pulverized. Hosing down is good if the studio is equipped with a suitable drainage system and clay trap. Floors should be sealed or made of easy-cleaning material. Vacuum cleaners are useful only if equipped with high efficiency (HEPA) filters to prevent fine silica dust from passing through regular industrial and household vacuum cleaners.

Glazes

Glazes used to color or finish clay pieces are a mixture of silica, fluxes and colorants. Common fluxes include lead, barium, lithium, calcium and sodium, and are used to lower the melting point of silica. The actual colorants, which are an assortment of metal oxides usually account for less than 5% of the glaze by weight.

Originally, soluble raw lead compounds including red lead, white lead, galena, and litharge were used as fluxes in low-fire glazes. In fact, over 400 cases of lead poisoning were reported in British potters in 1897. Lead **frits** and good housekeeping greatly lowered the number of potters that had been poisoned by these highly toxic lead compounds. Frits are made of melted minerals and metal compounds that are sintered and ground into powder form. While lead frits are sometimes assumed to be insoluble and nontoxic, leaching tests with acids have shown that many **frits** are as **soluble** as raw lead compounds **and**, in fact, there have been cases of lead poisoning from both inhalation or ingestion of **these**.

High fire porcelain and stoneware techniques eliminate the need for lead as a flux. Also, alkali earth or alkaline earth fluxes can be used for low-fire conditions instead of lead. Silica may also be removed from **leadless** type glazes. The substitution can be based on boric oxide as the glass-former, instead of silica. Alkali earth fluxes include sodium, potassium, and lithium oxides; alkaline earth fluxes include calcium, magnesium, barium, and strontium oxides. Minerals containing these fluxes include certain **feldspars**, **nepheline** syenite, **petalite**, bone and plant ashes, whiting, and dolomite.

An assortment of **metal** oxides or other metal compounds produce particular colors when fired. These are added in such **small** amounts to the glaze, that they aren't usually a great hazard. Luster or **metallic** glazes are fired in a reduction atmosphere. These glazes can contain mercury,

arsenic, highly toxic solvents such as aromatic and chlorinated hydrocarbons, and oils such as lavender oil. The common metals are often resins of **gold**, platinum, silver, and copper. Some underglazes and overglazes use mineral spirits as the vehicle instead of water.

Glaze components are weighed, sorted and mixed with water. These materials are often in fine powdered form, and result in high dust exposures. Glazes can be dipped, brushed, poured, or sprayed on the ceramic piece.

Hazards

1. Lead compounds are highly toxic by inhalation or ingestion. Symptoms of lead poisoning include: damage to the peripheral nervous system, brain, kidney, or gastrointestinal system, as well as anemia, **chromosomal** damage, birth defects and miscarriages. All lead compounds, including lead frits, are regulated by the Occupational Safety and Health Administration (OSHA).

2. Lead-glazed **foodware** can leach lead if not **fired** properly, or if the glaze composition is not correctly adjusted. For example, the addition of copper to lead **frits** renders a higher solubility of lead in the final fired ware. Acidic drinks and foods such as tomato juice, citric juices, sodas, tea, or coffee, can increase this hazard.

3. A glaze; label marked "**lead-safe**" means that the finished ware, if fired properly, **will** not release lead into food or drink. The actual glaze is still hazardous to handle and fire and may contain lead. Adequate control over firing conditions is very difficult in the craft studio.

4. Other fluxes such as barium and lithium are also highly toxic by inhalation, but less so than lead.

5. Certain colorant compounds of particular metals are known or probable human carcinogens, including: arsenic, beryllium, cadmium, chromium (VI), nickel, and uranium.

6. Antimony, barium, cobalt, **lead**, lithium, manganese, and vanadium colorant compounds are highly toxic by inhalation.

7. Antimony, arsenic, chromium, vanadium, and nickel compounds are moderately toxic by skin contact.

8. Free silica occurs in many of the clays, plant ash, flint, quartz feldspars, talcs, **etc.** used in glazes. See the discussion above for the hazards of silica and the disease silicosis. Weighing and mixing glazes can result in the inhalation of these toxic materials.

9. Soda ash, potassium carbonate, alkaline **feldspars**, and fluorspar used in glazes are skin irritants.

10. Spray application of glazes is very hazardous because of the potential inhalation of glaze mists.

11. Dipping, pouring, and brushing certain glazes may cause **skin irritation and accidental ingestion due to careless personal hygiene habits.**

12. Glazes containing solvents are both flammable and hazardous.

Precautions

1. Use lead-free glazes If the glaze does not state "lead-free" or "leadless" on the label, assume it contains lead until proven otherwise.
2. Lead glazes should only be used on non-foodware items Design lead-glazed pieces so that they won't be used for food or drink Lead-glazed pottery should be labeled as lead-containing.
3. If possible, don't use colorants that are known human carcinogens and avoid probable human carcinogens. There is no known safe level of exposure to carcinogens.
4. Weigh and mix powdered glazes using a movable exhaust hood, or wear a NIOSH-approved toxic dust respirator. Wet glazes are not an inhalation hazard. Good housekeeping procedures and cleanup of spills reduce the risk of inhalation or ingestion of toxic dusts. Wet mop spilled powders.
5. Gloves should be worn while handling wet or dry glazes. Barrier creams may cause glazes to creep during firing.
6. A spraybooth that exhausts to the outside is needed for glaze spraying Solvent-based glazes require explosion-proof spraybooths. If a spraybooth is impossible, individuals wearing a NIOSH-approved respirator with toxic dusts and mists filters, can work in front of a window exhaust fan. A respirator alone won't protect other workers present.
7. Good dilution ventilation or local exhaust ventilation should be available when applying solvent-containing glazes.
8. Basic personal hygiene rules should be followed including restricting eating, drinking, or smoking in the studio, and wearing personal protective equipment such as gloves, and separate work clothes or coveralls. Wash hands after work
9. Leftover glazes and glaze scrapings can be homogenized, combined, tested, and used as a glaze.

Kilns

Electric kilns and fuel-fired kilns are used to heat the pottery to the desired firing temperature. The most common type are the electric kilns.. Heating elements heat the kiln as electric current passes through the coils The temperature rises until the kiln is shut off.

Fuel-fired kilns are heated by burning gas (natural or propane), oil, wood, coke, charcoal or other materials. Propane gas or natural gas is used most often. These kilns can be either located indoors or outdoors. The fuels produce carbon monoxide and other combustion gases. Fuel-fired kilns are usually vented from the top through a chimney.

Firing temperatures can vary from as low as 1382° F for raku and bisque wares, to as high as 2,372 ° F for stoneware, and 2,642 ° F for certain porcelains.

The early stages of bisque firing involves the oxidization of organic clay matter to carbon monoxide and other combustion gases. Sulfur breaks down later producing highly irritating sulfur oxides. Also, nitrates and nitrogen-containing organic matter break down to nitrogen oxides.

Galena, cornish stone, crude feldspars, low grade fire clays, flourspar, gypsum, lepidolite and cryolite can release toxic gases and fumes during glaze firings. Carbonates, chlorides, and fluorides are broken down to releasing carbon dioxide, chlorine, and fluorine gases

At or above stoneware firing temperature, lead, antimony, cadmium, selenium and precious metals vaporize and the metal fumes can either escape from the kiln, or settle inside the kiln or on ceramic ware in the kiln. Nitrogen oxides and ozone can be generated from oxygen and nitrogen in air.

Hazards

1. Chlorine, fluorine, sulfur dioxide, nitrogen dioxide, and ozone are highly toxic by inhalation. Bisque firings of high-sulfur clay have caused the production of great amounts of choking sulfur dioxide. Other large acute exposures to gases are not common. Inhalation of large amounts of these gases can result in severe acute or chronic lung problems Long-term inhalation of low levels of these gases can cause chronic bronchitis and emphysema, Fluorine gas can also cause bone and teeth problems

2. Many metal fumes generated at high temperatures are highly toxic by inhalation. Since lead vaporizes at a relatively low temperature, it is especially hazardous.

3. Carbon monoxide from fuel-fired kilns or the combustion of organic matter in clays is highly toxic by inhalation and can cause oxygen starvation. One symptom of carbon monoxide poisoning is an intense frontal headache, unrelievable by analgesics

4. Many gas kilns have small canopy hoods over the exhaust on top of the kiln. These hoods are too small and often don't work adequately, especially during reduction firings, in which where there is a deliberate deficiency of oxygen. Even gas kilns equipped with chimneys often do not capture all the carbon monoxide. Kiln chimneys may be too short and allow kiln gases to enter nearby buildings.

5. There must be careful planning for additional exhaust systems in the gas kiln area A lack of makeup air may result in exhaust fans actually pulling carbon monoxide-contaminated air from the gas kilns into the room. Weather conditions also effect the efficiency of kiln draft.

6. Special effects are obtained by the addition of materials which can generate other toxic kiln emissions.

7. Hot kilns produce infrared radiation, which is hazardous to the eyes There have been reports of cataracts, from years of looking inside the hot kilns

8. Heat generated by the kiln can cause thermal burns The Edward Orton Jr. Ceramic Foundation reported that when a kiln was operated at 2370 °F, the surface temperature, was at and above 595 ° F, and the temperature one foot away from the peephole was 156 °F.

9. Heat produced by even small electric kilns can cause fires in the presence of combustible materials or flammable liquids This can include a wooden floor.

10. If an electric kiln fails to shut off, the heating elements melt which can cause fires. Gas kilns also generate a lot of heat, and room temperatures often exceed 100° F.

11. Natural gas and propane are fire and explosion hazards. Since propane is heavier than air, it can collect at floor level and not disperse.

Precautions

1. Ventilate electric and **fuel-fired** kilns with local exhaust ventilation, such as a **canopy hood**. Top-loading electric kilns may have to be enclosed with fireproof curtains since the canopy will be located too high from the kiln top to be effective. Curtains should be short enough to allow entry of makeup air.
2. Ready-made, commercial canopy hoods that can be raised or lowered must be tested in actual use for effectiveness.
3. The Orton Foundation has a direct exhaust system, which attaches to the bottom of octagonal kilns exhausting air inside the kilns through holes made in the top and bottom of the kilns. This **system** is only effective in relatively new kilns **that don't leak**.
4. Electric or fuel-fired kilns should be kept in a separate room to reduce **excess** heat in the working studio. If no one works in the 'kiln room, then electric kilns can be safely vented with a window exhaust fan placed near the kiln.
5. Adequate makeup air should be available for any exhaust systems in the kiln area.
6. Chimneys should have a high enough stack to prevent exhaust from re-entering the building. High-velocity stack fans may be necessary.
7. Infrared goggles approved by the American National Standards Institute (ANSI) or hand-held welding shields should be worn when looking into the operating kiln. Shade number from 1.7 to 3.0 is recommended, but a darker shade may be required if spots appear in front of one's eyes after looking away from the kiln.
8. Do not use lead compounds at stoneware temperatures since the lead will **vaporize**.
9. Lumber, paper, solvents, or other combustible and flammable materials should not be stored in kiln areas. Raise electric kilns at least a foot off the floor, and place at least two feet from any wall, allowing air circulation. Wooden floors should be protected with non-asbestos containing fireproof materials (e.g. firebrick).
10. All electric kilns should meet local fire and electrical codes, and should be installed by a licensed electrician.
11. Electric kilns should have two automatic shut-offs. The primary shut-off should be a cone-operated shut-off or a pyrometer. **A timer backup should** also be installed to ensure reliability. **Always** check that the kiln has shut off.
12. A carbon monoxide alarm should be provided for the area where indoor gas kilns are located.
13. Gas lines should be installed by qualified personnel.

Regulators, to automatically shut off kilns if the air flow stops or if a **negative** pressure develops are needed.

14. If gas leaks are suspected (e.g. gas odor): shut off gas at the source; shut off power to the kiln room at the circuit breaker; and call the gas company. Test for leaks with nonfat, soapy water or use approved leak-detection solutions.

Special Processes

While most glaze firings refer to firing a glaze-coated pot in the kiln, special processes sometimes are used. Salt glazing and raku firing are two examples.

Salt Glazing

This process involves throwing wet salt (sodium chloride) into the heated kiln while the bisque ware is being fired. Wet salt at high temperatures decomposed to sodium and chlorine. The sodium reacts with the bisque ware to form a glaze. Large amounts of hydrogen chloride gas and possibly chlorine are also formed.

Sodium carbonate (washing soda) can also be used. Carbon dioxide is generated instead of hydrogen chloride.

Hazards

1. Hydrogen chloride gas is highly toxic by inhalation. Health effects are both similar and more irritating compared with most other kiln gases. Often, local environmental protection laws ban salt kilns.
2. Hydrogen chloride and water vapor form hydrochloric acid, which can corrode metal fittings in the area.

Precautions

1. Substitute safer sodium carbonate for sodium chloride.
2. Sodium chloride salt glazing should only be done outdoors. Kilns should be equipped with canopy hoods and chimney stacks that are tall enough to disperse the hydrogen chloride safely.
3. All gas piping, and metal fixtures should be routinely checked for corrosion.

Raku Firing

Raku involves first firing ware at a low temperature in a regular gas kiln, and then removing the still hot pieces and placing in them in sawdust, leaves or other organic materials for a reduction phase.

Hazards

1. See above for the hazards and safety precautions used with gas kilns.
2. The reduction step produces large amounts of smoke and carbon monoxide.
3. Treated wood or other materials can yield an exposure to highly toxic preservatives or pesticides, such as arsenic and chromium compounds.

Precautions

1. Raku should only be done outdoors because of smoke. Be careful to not locate raku near air intakes or open windows of buildings
2. Do not use materials that have been treated with preservatives or pesticides for the reduction phase.

Leaching of Finished Ceramic Ware

Lead Leaching

There is a real concern about lead leaching into food and drink from pottery fired with lead glazes. Both the U.S. Food and Drug Administration (FDA) and the Canadian Consumer and Corporate Affairs have regulated how much lead can leach from **foodware** into food and drink. Acidic liquids are of particular concern. Similarly, continual microwave reheating, (e.g. a coffee mug at work) can yield greater leaching of lead glazes. Many cases of lead poisoning, and even some fatalities, have occurred from the leaching of lead from lead-glazed pottery.

Ceramic ware can be tested by placing acid in the vessel for 24 hours, and then testing the liquid to see how much lead has leached. 1991 FDA guidelines give the maximum amount of lead that can leach from various types of ware:

flatware (e.g. plates, saucers, etc.)	3 ppm
small hollowware (e.g. cereal bowls)	2 ppm
cups and mugs	0.5 ppm
large hollowware (e.g. bowls over 1.1 liter)	1 ppm
pitchers	0.5 ppm

While commercial ceramics companies routinely test their ware for lead leaching, craft potters do not have the same quality control as does the ceramics industry, and lead leaching is more of a problem.

According to United States regulation, ceramicware that does not pass the lead leaching tests must have a permanent fired decal stating:

"NOT FOR FOOD USE - MAY POISON FOOD. FOR DECORATIVE PURPOSES ONLY."

As mentioned earlier, you can also drill a hole in the pottery so it cannot be used for liquids or food.

Preferably, do not use lead glazes, especially for food and drink vessels. Any **foodware** finished with lead glazes should be tested regularly by certified laboratories. Home kits can be used for testing lead leaching, but one shouldn't only rely on these. Below is a list of several kits.

Lead-test Kits

1. Test for Lead in Pottery (\$25) and The FRANDON Lead Alert Kit (\$29.95), Frandon Enterprises, Inc., P.O. Box 300321, Seattle, WA, 98103; telephone (800) 359-9000.
2. LeadCheck Swabs (\$30), HybriVet Systems, Inc., P.O. Box 1210, Framingham, Mass. 01701; telephone (800) 262-LEAD.
3. LEADCHECK II (\$25). distributed by Michigan Ceramic Supplies, 4048 Seventh Street, P.O. Box 342, Wyandotte, MI. 48192, telephone (313) 281-2300.

Other Leachable Metals

Other metals can leach into food and drink. Cadmium is the single metal besides lead presently regulated in the United States and Canada. However, other possible toxic metals in glazes can leach. Barium has been seen in some tests to leach in hazardous amounts from certain glaze formulations. If a barium glaze, or other glaze, changes color from contact with food, do not use the vessel for food. Try and use only glazes with calcium, magnesium, potassium, and sodium fluxes and minimize the amounts of toxic metal colorants. Routine testing for other metal leaching should be done. More research needs to be done in this area.

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For Further Information

Written and telephoned inquiries about hazards in the arts will be answered by the Art Hazards Information Center of the Center for Safety in the Arts Send a stamped, self-addressed envelope for a list of our many publications Permission to reprint this data sheet may be requested in writing from CSA. Write: Center for Safety in the Arts, 5 Beekman Street, Suite 1030, New York, NY 10038. Telephone (212) 227-6220.

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Nonfired Products

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Tip: Brush-On Sealers can also be used over fired underglaze colors as a sealer in place of a fired glaze on decorative objects.

Ceramic Spray Sealers

Characteristics

Ceramic Spray Sealers are final spray coatings that produce smooth, hard surfaces. They are used to brighten the colors and protect the finishes of objects decorated with nonfired color products.

SS 330 Super Gloss has been especially formulated to produce an extremely lustrous, smooth and hard final finish. Because of its unique focus on the glossiest possible spray finish, Super Gloss is not recommended as an in-between sealer for oil-based nonfired colors. Super Gloss can be used over all Duncan nonfired colors, both oil-based and water-based, as a final spray finish.

SS 331 Clear Gloss and SS 332 Clear Matte, quite apart from their functions as color-brightening, hard protective finishes, add dimension to decorating with nonfired products by multiplying the techniques you can use with the already versatile nonfired colors and accessory products. These Ceramic Spray Sealers can be used over, under and between all Duncan nonfired colors, depending upon the desired finished results and the technique used.

One of these Ceramic Spray Sealers or Porcelain Ceramic Spray Sealer is necessary as the in-between sealer when rouging with the Oil-Based Transluents. Clear Matte and Porcelain are especially recommended as the required in-between fixative when rouging with translucent colors.

In antiquing techniques where the bright, original colors of the acrylic base colors are desired, spray on a coat of Clear Gloss or Clear Matte before antiquing. This intermediate coat will prevent the usual toning down of the original color when antiquing.

SS 333 Translucent Pearl has all the desirable characteristics of the other Ceramic Spray Sealers and, while

Translucent Pearl can be used as an intermediate sealing coat in the same manner as Clear Gloss, Clear Matte and Porcelain, Translucent Pearl is especially designed to add a beautiful pearlescent sheen over nonfired colors.

SS 334 Porcelain produces both the look and feel of fine porcelain bisque when applied over a fired glaze or Duncan Prep-Coat. It can be used between or above layers of nonfired acrylic and translucent colors, depending on the decorating technique used, to produce an attractive matte surface. Porcelain is especially well suited as a final finish over drybrushed items.

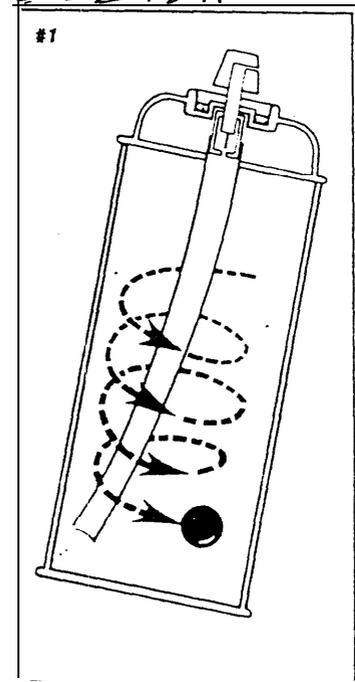
Porcelain Ceramic Spray Sealer works very nicely with chalks to give the soft appearance of china paints. Use a fired glaze, Prep-Coat or a Bisq-Stain Opaque as the base coat. Spray with Porcelain, then gradually add layers of lighter or darker chalk colors for shading, spraying between each layer of chalk. Spray with Porcelain for the final protective finish.

SS 339 Super Matte produces a smooth, even, flat-matte finish on nonfired acrylic and translucent colors. It slightly softens the underlying colors and provides a shine-free, protective surface. Like other Ceramic Spray Sealers, Super Matte can also be used between layers of opaque or translucent stains for a variety of effects. Super Matte is particularly attractive as the finishing touch on realistic CeramiCritic animal figurines.

How to Use Ceramic Spray Sealers

Shake all aerosol products before using.

All Ceramic Spray Sealers contain a "marble" (agitator bail) and should be shaken for 1 full minute after marble moves freely, and often during use. The marble acts very much like a stir stick in a conventional can of paint. In order to make sure all ingredients are mixed well together, shake can in circular motion so that agitator is rolling around sides of can (#1).



Before spraying any object, test spray on scrap surface to get "feel" of can and to make sure can is spraying properly. Start spraying to side of object and move spray onto surface of object. Stop spraying only after you have moved spray off to side of object. Never start or stop spraying directly on object. Keep can in constant motion while spraying. A slow, even movement is best, giving better coverage and preventing runs and sags caused by spraying one spot heavily when you stop moving can.

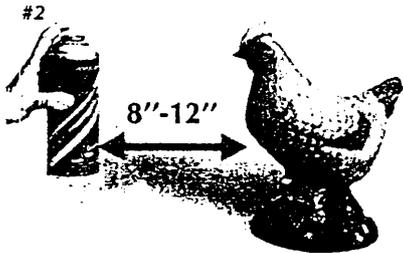
Most sprays perform best when held approximately 8" to 12" from object. However, this may vary with particular product and climate in your area. Always check directions on can. Holding can too far away will produce too light a coating. Holding can too close will cause sags or runs. Weather can affect any aerosol product. If weather is very cold and cans are stored outdoors, allow cans to warm at room temperature before spraying. If weather is very hot and dry, holding can too far away (and sometimes, under extreme conditions, even distance recommended on can is too far away) can allow solvents in spray to evaporate. When this occurs, spray dries before it hits object, forming small, white particles on object instead of a smooth, clear surface. In this case, you must adjust distance until you can achieve a "wet" thin film.

If weather is very hot and humid,

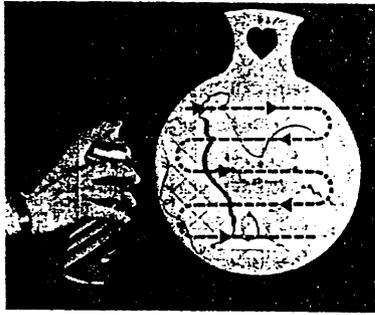
Nonfired Products

Ming can too close will cause heavy coating and could accentuate "blushing" problem (milky appearance) on surface of object. When there is extreme humidity, the moisture may become trapped in spray film, causing milky white appearance. In most cases, blushing will go away within half an hour but could problem remain, simply wait until a less humid, clear day and spray. This should release trapped moisture by reopening surface and allowing it to evaporate, leaving clear, transparent film.

Always try to attain wet, thin film on surface being sprayed and always spray directly head-on at object (#2). Apply as many coats as necessary for desired effect; 2 light coats are better than 1 heavy coat. Remember to keep moving once spray is hitting object. Do not stop spraying until you have moved spray off to side of object.



Spray cans perform best when held anywhere from vertical position to 45-degree angle. To tilt can more than 45 degrees could cause sputtering or no spray at all. For this reason, when spraying flat surface, slant object at 45-degree incline and spray with can held at 45-degree angle also. This will allow a straight, head-on application (#3). Always start off object in upper left-hand corner and go back and forth in even, side-to-side motion ending in lower right-hand corner, letting each stroke come completely off object and overlapping each stroke approximately one-third (#4). When finished, turn object 90 degrees and repeat same procedure in opposite direction. This will result in very even, uniform coating.

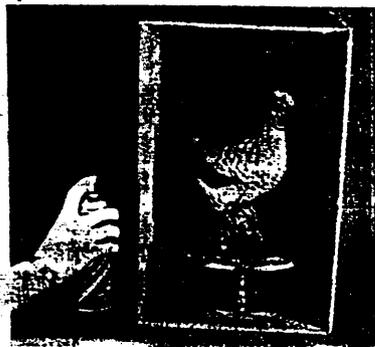


When spraying back and forth, hold can at same distance from object rather than swinging can in arc. When spraying round, sculptural or deeply relieved objects, spray in round, circular motion instead of from side-to-side (#5). Always spray directly (head-on) at object, and from correct distance. Start spraying off surface of object and finish off surface of object.



When spraying, spray button should be released from time to time, as holding button down for continuous periods may reduce temperature of can, resulting in lost pressure. This can be easily remedied by letting can stand for short period before continuing to spray. However, to prevent this from happening, develop habit of releasing spray button occasionally while spraying but remember, release only when spray is off to side of object.

When spraying, always spread newspapers around to catch any overspray. A cardboard box with one end removed will make an excellent spray-booth. A decorating turntable or

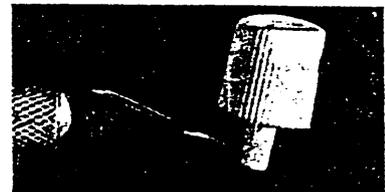


banding wheel is also very useful when spraying round objects, allowing all sides to be covered without touching object (#6).

Spray cans have a dip tube, very much like a soda straw, that runs from spray button down to bottom of can. When not used for a long period of time, some product may seep up this tube and become somewhat hardened. When this happens, product in can is not harmed but spray button must be worked up and down a number of times, with can held upside down, until worm-like residue is forced out. This will clear tube and permit perfect spray. To avoid this situation, when you are through using spray can and before putting it away for any length of time, can should be turned upside down and sprayed until only clear gas escapes (#7). This procedure will clear product from tube.



To further correct spray can that is not spraying properly, first give spray button a quarter turn after wiping off any residue that might have accumulated around spray hole. If spray is still faulty, twist off button (spray head) from can. Using small knife blade, clean metering slot at bottom of spray head stem (#8). Using a straight pin, clean spray hole (#9). Reinsert spray head firmly into can, making sure spray hole is pointed away from you. Can should now spray properly..

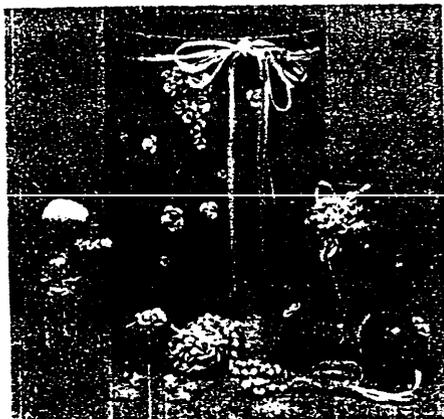


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Porcelain Flowers

Characteristics

Duncan Porcelain Flowers are handmade of white or tinted porcelain in a wide range of colors. The red roses and holly berries are hand-painted. Beautifully detailed and of the finest quality, Porcelain Flowers are Project Finishers that add distinctive final touches to many different types of ceramics and craft items. Porcelain Flowers can be applied as accents on home decor, such as vases, mirrors, frames, lamps, lampshades, candleholders, bath and boudoir items, and to many other objects, like baskets, wreaths, hats and other personal accessories. They are very appealing on wedding and party items, and on holiday decorations and ornaments. They make romantic jewelry when paired with jewelry findings, and Porcelain Flowers are also unusually stunning on fabric.



Porcelain Flowers can be applied to all kinds of ceramics and household items.

Application

Fired glaze surfaces: Use epoxy to attach Porcelain Flowers to the clean, dry piece.

Unfired glaze surfaces: Wipe away a small patch of glaze wherever you want to attach the Porcelain Flowers. Affix the Porcelain Flowers to the bisque with a mixture of equal parts of Patch-A-Tatch and the same glaze, then glaze fire the item to witness cone 06. **Tip:** The smaller Porcelain Flowers work best with this technique, because the weight of the larger flowers may cause them to move in the glaze firing. **Special note: Do not fire red-painted flowers and holly berries.**



Add a unique personal touch to wedding and anniversary decorations and favors.

On items decorated with nonfired colors and craft surfaces: For permanent adhesion on most craft

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surfaces, use epoxy to affix Porcelain Flowers to the desired areas. When attaching the flowers to wreaths, ornaments, baskets and similar items, use a hot glue gun or silicone adhesive.

Fabric: Fabric application requires a two-part, five-minute epoxy. To wash a garment decorated with Porcelain Flowers, simply turn the garment inside out. Dry the inside-out garment on the gentle cycle.



Create one-of-a-kind fashions with Porcelain Flowers.

Basic Application Techniques

This section explains and illustrates some basic application techniques that can be used with various Duncan ceramic colors. For specific information on the number of coats needed, recommended thinning agents and other information, refer to the appropriate section of this manual for each color family

Airbrushing

Airbrushing produces realistic effects on figurines and in scenic designs quickly and efficiently. It is

also effective for dinnerware borders, freeform design work and much more. Use a clean stir stick and a clean plastic cup for each color being thinned for airbrushing. Thin water-based colors with Duncan Thin 'n Shade and oil-based colors with Duncan Antiquing Solvent. The proper color consistency for airbrushing depends on the color medium being used. (Refer to specific color family section in this manual for recommended airbrushing consistency.) Working with one mixture at a time, stir mixture vigorously with a glaze brush

to remove any lumps or heavy particles. Clean brush thoroughly after stirring each mixture. For each color application, fill a clean airbrush with thinned color and test-spray on scrap greenware or bisque before airbrushing your actual piece. If the color drips when sprayed, the consistency may be too thin or the airbrush may be too close to the surface of the ware. If the color appears grainy or will not spray, the mixture is too thick. Add color thinner as needed and retest before airbrushing your actual piece.

Basic Application Techniques

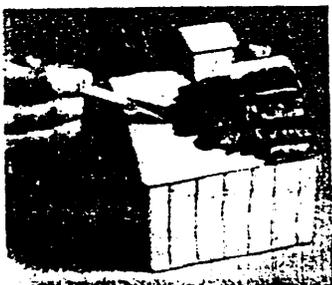
brush color(s) on the ware, blending the edges of each color into adjacent areas or masking off areas with Mask 'n Peel, Wax Resist or Tape, depending on the technique being used. Once airbrushing is complete, bisque fire underglazed ware to witness cone 04, then finish with a clear or transparent (colored) glaze. For nonfired projects, finish with the desired Ceramic Spray or Wash-On Sealer.



airbrushing produces realistic effects on animal figurines.

Antiquing

Antiquing an item decorated with unfired colors softens and enriches the underlying color(s). Use a soft brush to apply 1 coat of oil-based or water-based translucent color, or a fired color that has been thinned with Thin 'n Shade (50% color, 50% Thin 'n Shade) over the ware. Wipe back with a soft cloth or facial tissue, leaving some color on the ware and revealing areas on detailed items. If a lighter finish is desired; dampen a clean cloth or tissue with water or Antiquing Solvent, depending on the color product being used, and continue the wiping-back process. If a



Apply antiquing color,

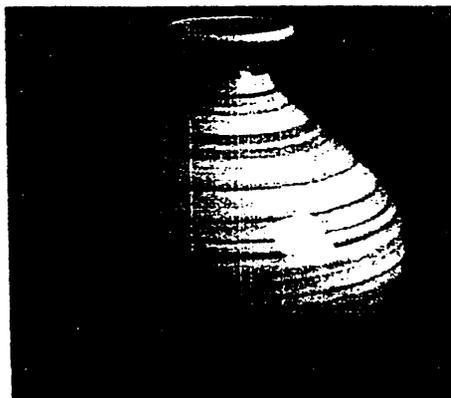
deep-toned antique effect is desired, repeat the antiquing steps. Refer to **the section on underglazes for antiquing done with E-i? Strokes, Red-Strokes, Design-Coats and Fired Antiques.**



Wipe back.

Banding

Two methods are used to create bands of color on ceramics. Ware with circular shapes such as cups, plates, vases, etc. can be centered on a banding wheel. To keep the item centered on the wheel, place a plastic bag inside the piece, then carefully add enough sand or fine gravel for weight. The wheel is then turned slowly with one hand, while the other hand holds a brush loaded with color to the ware. Depending on the color product being used, band with slightly thinned or undiluted color. Apply 1 coat of translucent underglaze or nonfired color, and 3 coats of opaque underglaze color. While a Liner brush is often used for banding, a Fan brush can be used to band on color(s), producing streaky bands of color for effective overall coverage. (When banding application is completed, carefully pour out the weighting material and remove the bag. This ensures that all material and dust is removed, and leaves the inside clean.)



Banded decoration.

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Controlled Glazing

This technique consists of butting two or more glazes on a piece. (See Glossary for explanation of butting.) Apply the appropriate number of glaze coats (per glaze label) to the desired areas. Controlled glazing is used for a variety of decorative effects. Some examples are a vase with a textured glaze on the body and a smooth glaze on the neck; a figurine with realistic glaze colors applied to the various areas; and flat-surfaced items with design work or patterns.



Controlled glazing technique.

Dots

A very easy and convenient way of applying color, dots can be used for human and animal eyes, flower centers, dot-petal flowers, overall patterns and on areas of clothing. Dots are also an integral part of many folk art brushstroke techniques. Various sizes of single dots can be made with the wooden tip of brush handles and the small and large ends of the Stylus tool. Dot patterns can be made with the individual tips of the Duncan Dot Maker tools. Dots can be made with underglazes, glazes and nonfired colors. Place a small amount of slightly thinned translucent color or undiluted opaque underglaze color or nonfired color on a glazed tile. Spread the color shallowly on the tile with a palette knife. Dip the end of a brush handle, Stylus or Dot Maker tip in color and touch it to the surface of the ware to create dots or a dot pattern. For dots of equal size, reload for each application. For dots descending in size, continue to stamp

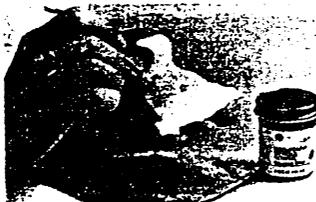
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Basic Application Techniques

a trail of dots without reloading. In folk art, where two trails of descending dots are placed on each side of a large dot, reload the tool for the second trail but touch the tool once to a clean area of the tile before applying to the ware, so the second trail will not begin with a large dot.



Loading a Dot Maker with color.

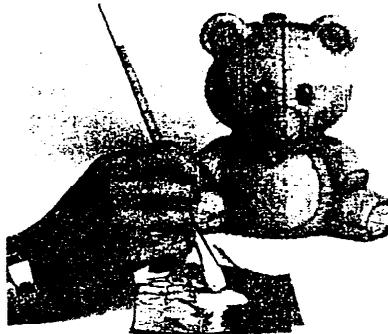


Applying dots to the ware.

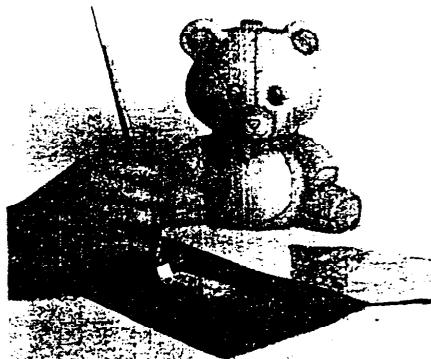
Drybrushing

Named from the way the color is applied — dusted on very lightly, with an almost dry brush — the versatile drybrushing technique ranges from spectacular effects where almost every color is drybrushed to minimal effects, such as drybrushing a blush of color on the cheeks of figurines. Because drybrushing highlights the details of the ware, it is extremely important that the greenware be very carefully cleaned and checked for flaws, and that the base coat color(s) be applied as smoothly as possible. Use a nonfired water-based acrylic color as the base coat, applying 1 or more coats as needed. After the base-coat application, the ware can be antiqued before drybrushing if desired. Dip an Opaque brush tip into another water-based acrylic color and brush the color back and forth over a flat brown paper bag, a coffee filter or a paper towel until almost no color shows up on the paper. Now dust the brush over the ware, repeating the process until the desired effect is achieved. Colors can be **drybrushed** over various parts of the ware to create natural effects such as animal fur or bird plumage, and the colors can be applied over one another. Depending on the particular

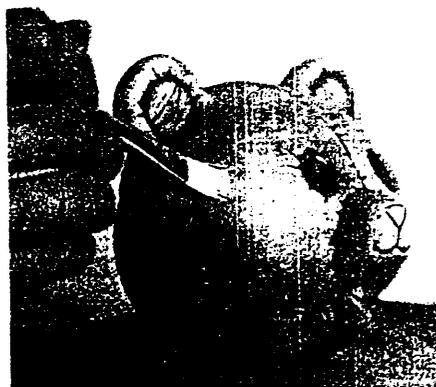
drybrushing technique you are using, start with a pale base coat and drybrush the darkest colors last, or begin with a dark base coat and drybrush the palest colors last. Porcelain Ceramic Spray Sealer is the recommended finish for drybrushed items.



loading the brush for drybrushing.



Brush on brown paper bag, paper towel or coffee filter to remove excess color.



Dust color onto the piece?;

Majolica

This technique involves the application of E-Z Stroke translucent underglazes in design over unfired glaze. Select a nonmoving glaze such as- Downright White Gloss Glaze, Sand Art Glaze, a matte-finish

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Lo-Sheen or Art Glaze, or a Dimensions Textural Glaze, so that the design or pattern does not become distorted in the glaze firing. Typical majolica designs are traditional fruits, flowers and leaves, abstracts or patterns. After the glaze firing, the design is a permanent part of the glaze surface. If the underlying glaze is dinnerware safe, the completed ware will also be safe for food and drink containers.



Majolica technique.

Rouging

Rouging produces the soft ilush of color often seen on Austrian figurines and in some china painting effects. This method of decoration is achieved by using small cloth pads to apply a nonfired water-based or oil-based translucent color, or a nonfired water-based acrylic color thinned with Thin 'n Shade (50% color, 50% Thin 'n Shade) over a dry base-coat color. The various layers of color must be allowed to dry between coats, but only the oil-based colors require the use of a sealer as a fixative between each layer of dry color. (Clear Matte or Porcelain Ceramic Spray Sealers are recommended as the fixative.) For each color, fold a piece of lint-free cloth into several layers, making a small pad over your index finger. Shake the jar of color well and use only the color left inside the lid. Dip the pad into the color, blot off the excess on a paper towel, then rouge colors onto the desired areas of your

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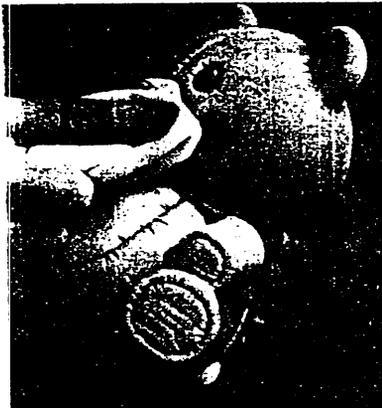
Basic Application Techniques

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are by gently rubbing with a circular motion. Blend the color smoothly, applying less color toward the edges of each rouged area for a natural look. If a deeper tone is desired, repeat the rouging steps.



For rouging; dip cloth pad into color and blot on paper towel.

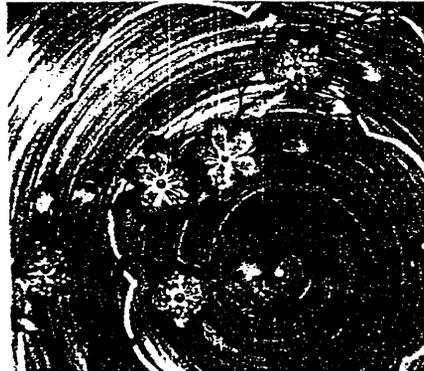


Rollage on color with gentle, circular motion.

Sgraffitoing

This technique is a method of revealing a design by gently scratching rough unfired underglaze color applied to the ware to reveal another color or the clay body beneath it. This term is sometimes confused with incising — cutting-into the painted clay surface to create a design — since the same tool is used.) Because sgraffitoing is best done while the color is still damp, work quickly to sketch or trace a design over the unfired underglaze color. Work with one small area of your design at a time. Use the Sgraffito-Duster tool with the hollow side of the blade down to gently scratch fine, shallow lines along the sketched or traced design lines, then go over the lines a few more times, gradually deepening and widening the lines. Evenly carve any wide design areas down to the depth of sgraffitoed lines. To avoid chipping

the color, always pull the tool toward you and, in areas where two lines intersect, pull the tool away from a point on each side of the previously sgraffitoed line. Use the brush end of the Sgraffito-Duster tool with the hollow side of the blade down to gently scratch fine, shallow lines along the sketched or traced design lines, then go over the lines a few more times, gradually deepening and widening the lines. Evenly carve any wide design areas down to the depth of sgraffitoed lines. To avoid chipping the color, always pull the tool toward you and, in areas where two lines intersect, pull the tool away from a point on each side of the previously sgraffitoed line. Use the brush end of the Sgraffito-Duster tool to remove any color particles and dust from the sgraffitoed lines as you work. If the color becomes too dry, moisten the area to be sgraffitoed with a slightly dampened sponge, being careful not to overwet the piece.



Sgraffitoed plate.

Spattering

This is a quick-and-easy method of adding color highlights over a design or a plain base-coat color. Spattering is particularly effective for country-styled ceramics, as it is a traditional technique, highly favored by old-time



Spattered duck bookend.

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 potters. Load a stiff-bristled Opaque brush with undiluted or slightly thinned color, depending on type of color being used (underglaze, glaze or nonfired color). Hold the brush several inches above the piece and run your fingertips through the bristles to produce a fine spatter of color on the base-coated ware. More than one color can be spattered on the same piece.

Sponging

Sometimes called sponge veiling, sponging is a simple way to create two-tone or multicolor effects. It is excellent for creating country-styled ceramics, since it is an authentic technique formerly used by factories and individual potters to create crockery and kitchenware for farming communities. Place a small amount of slightly thinned translucent underglaze color or undiluted opaque underglaze or nonfired color on a glazed tile. Spread shallowly over the tile with a palette knife. Use a slightly dampened sponge to apply 1 to 3 coats of color over the greenware, bisque or base-coat color (depending on the color product being used), allowing the underlying surface to show through here and there. One or more colors can be sponged on the same item.



Sponging color onto the ware.

Spot Glazing

This is a method of placing glaze on various areas of the ware, leaving other areas unglazed. Some examples are glazed eyes on figurines and partial glazing on fired terra-cotta Cover-Coat or stoneware bisque. Spot glazing can produce very dramatic decorative effects and is frequently seen on award-winning showpieces. Another form of spot glazing is applying different glaze colors in

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Basic Application Techniques

random patches over an entire piece, such as a large vase. Again, the recommended number of coats should be applied. The result is a variegated abstract pattern, which can be very pleasing.

Stenciling

A form of folk art decoration, stenciling can be used with underglazes or nonfired colors. Stencils work best on flat or cylindrical surfaces. The direction of the stencil can be reversed by turning the stencil over and applying color through the "back" side. Stenciling can be done on greenware, bisque or a base-coat color, depending on the color product and technique being used. Colors can be applied through the stencil with a slightly dampened sponge or a Stencil brush, using a circular or straight stroke, or a pouncing stroke (dabbing the color on with a quick up-and-down motion). Position the stencil on your ware, and hold it in place with tape or the fingers of one hand. Load a sponge or a Stencil brush with color, then lightly- pounce on the tile or a paper towel to remove the excess color. Apply 1 to 3 coats of color (depending on the color product being used) through each opening of

the stencil to create the stenciled design. Remove the stencil when color is dry and, if needed, immediately clean both sides of the stencil before repositioning it on another area of the ware.



Applying color through a stencil.



Removing stencil.

Stippling

This is a method of applying color by pouncing the tip of a brush loaded with color against the ware. Use this application method to create realistic foliage, flower, grass, cloud and water effects, and highlighting and shading on figurines. It can be used with both underglazes and nonfired colors. Load your Deerfoot Stippler brush with color. Hold the brush between your thumb and forefinger, letting the handle rest on your middle finger, and with the longest end of the brush hairs on top and away from you. Hold the brush at a slight angle toward you and use a quick up-and-down motion to stipple or pounce the color onto the desired areas of your ware.



Pouncing on stippled color with quick up-and-down motion.

Tools and Brushes

Duncan Ceramic Tools

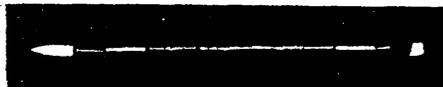
You'll *use ceramic tools for cleaning greenware, drilling cutting pierced openwork, borders, trims, overall designs, lace draping, incising, sgraffitoing and more. Duncan tools expand your creativity to the clay itself!*

Cleanup TL 401



The most popular tool for removing seamlines and small blemishes from greenware. Double-ended, with one flat triangular blade and one curved pointed blade.

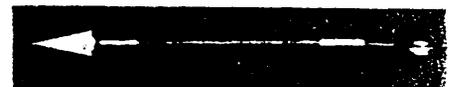
Spear Tip Cleanup TL 402



An **excellent** tool for general cleanup-of **greenware** with narrow openings as **well as** for **re carving** lost detail on finely detailed ware.

Double-ended, with one flat spear-shaped blade and one curved pointed blade.

Large Cleanup TL 403

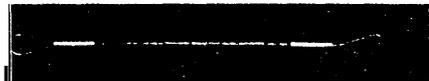


A bigger version of TL 401 Cleanup, this tool is excellent for cleaning large, heavy pieces. Double-ended, with one flat triangular blade and one curved pointed blade.

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Tools and Brushes

Carbon TL 404



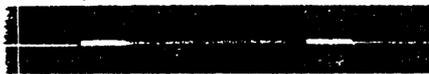
This tool is designed for cutting and slicing designs in leather-hard greenware. A double-ended tool, with one end flat and the other oval.

Double Drill TL 405



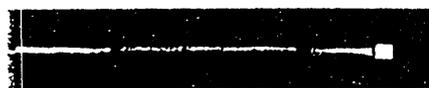
The perfect sizes for drilling holes in greenware. The chisel tips and uniform spirals provide clean, precisely formed holes with minimum effort. One drill is 3/16" in diameter and the other is 1/8" in diameter.

Needle Draper TL 406



A must for lacedraping techniques. The needle end is fine and sharp for lifting delicate lace, and the angular bent foot is perfect for dressing lace into place.

Sgraffito-Duster™ TL 407



Double-ended, with the cutting end tapered to allow for gradual deepening and widening of lines, and the other end a soft camel hair brush for removing dust from sgraffitoed lines.

Zigzag Saw TL 408

This tool is used to cut out designs in dry greenware. Use light pressure and a sawing motion to cut in any direction.

Wire Loop Sgraffito TL 409

A double-ended tool with a small end for shallow cuts and a large end for deepening cuts. Used for incising leather-hard or dry greenware, and for sgraffitoing through color.

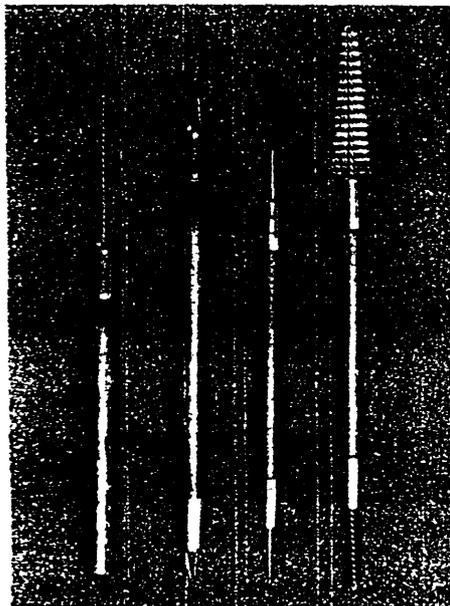
Stylus TL 411

Excellent for tracing patterns onto greenware, for incising work and for stamping single dots of color onto ware. This double-ended tool offers two balls of different diameters for fine and extra-fine work.

Double Spiral TL 412

This double-ended brush tool

provides a small, straight bristle spiral and a large, tapered bristle spiral. Excellent for smoothing hard-to-get-at areas and holes.



Deep Cleanup TL 413

Perfect for cleaning the inside surfaces of deep, narrow pieces. The crescent-shaped blade is sharpened on both sides for easy cleanup of both side walls and the bottom of the ware.

Sponge TL 414

This long-handled tool is excellent for sponging the inside surfaces of greenware or bisque.



Replacement Sponge TL 415

For use with TL 414 Sponge or can be used alone for general cleanup sponging of greenware or bisque.

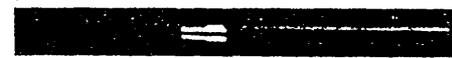


Glaze Saw TL 416



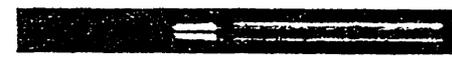
For widening holes covered with fired glaze and cutting bisque. Use heavy pressure and a sawing motion. Wear safety glasses.

Saber Saw TL 417



This tool is used for making straight cuts in dry greenware. Use light pressure and a sawing motion.

Large Zigzag Saw TL 418



This tool is used to cut out designs in heavy, thick-walled greenware. Cut in any direction, using light pressure and a sawing motion.

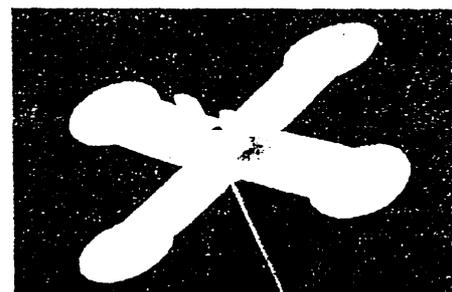
Palette Knife TL 420

Off set Palette Knife TL 421

For mixing and blending of colors on glazed tile or palette, and for applying color in palette knife techniques. Also ideal for removing clay from pour holes after casting a mold.



Mixing Tool TL 422



Designed to fit into the small mouths of 1-gallon containers of ceramic glaze and slip for thorough mixing. Flexible blade springs back to its original shape, once inside container. Tool shaft fits all 1/4" or larger standard electric drills.

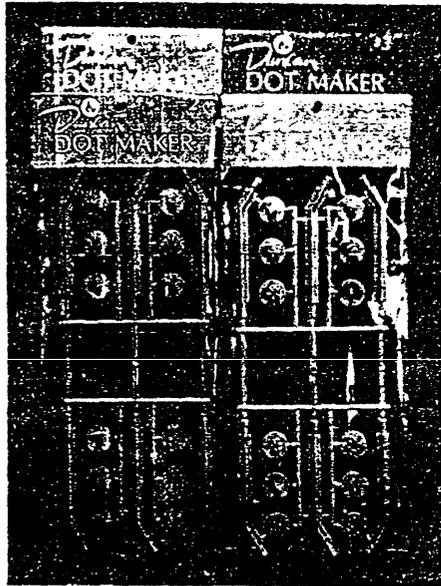
Replacement Blades for Mixing Tool TL 423

Flexible replacement blades — each good for between 200-300

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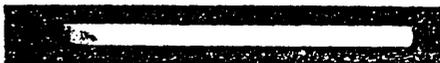
Tools and Brushes

- Dot Maker #1 TL 430
- Dot Maker #2 TL 431
- Dot Maker #3 TL 445
- Dot Maker #4 TL 446



Each Dot Maker produces 12 designs from 12 individual tips on six handles. They work equally well with underglazes and nonfired colors. With the variety of patterns and a simple application technique, these tools make country decorating and fabric-look detailing both quick and easy.

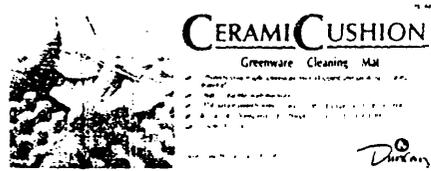
Special Additions Decal Tool TL 433



Smooths nonfired decals on pieces quickly and easily, and eliminates air bubbles.

Greenware Cleaning Accessories

CeramiCushion Greenware Cleaning Mat TL 443



Protects fragile greenware from chipping and breaking during cleaning. Made of durable, washable foam, the flat 12" x 12" surface protects the work area and the ridged surface cushions greenware.

CeramiScrub Greenware Cleaner TL 444



Removes greenware seams quickly and easily, and won't pit or groove delicate greenware.

Shortcuts Ceramic Tools

Greenware Seam Cleaner TL 439
Clean seam lines easily and evenly. Simply pull the steel band along the seam line — no digging or scratching!

Palette Knife TL 440
This indispensable tool cleans easily; won't break or rust.

Gold Applicator TL 441
Works like a felt pen with three interchangeable felt tips for Bright Gold and White Gold designs.

Decal Squeegee TL 442
Smooths fired decals on pieces quickly and easily, eliminates air bubbles and does not distort or tear decals.

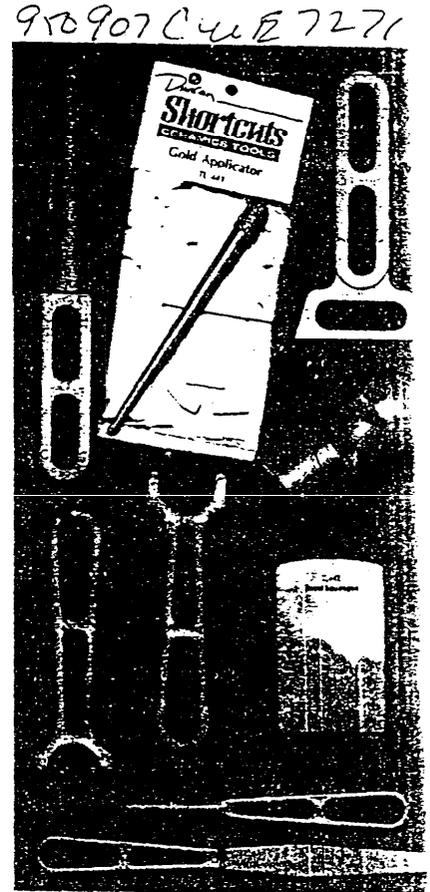
Shortcuts Casting Tools

Small Trim Knife TL 434
Large Trim Knife TL 435
Durable and flexible, yet rigid enough to get the job done! Two sizes for easy handling.

Rung Cleaner TL 436
Especially designed to clean the rungs and rods of your pouring table.

Mold Scraper TL 437
The easy way to keep the outsides of molds clean.

Mold Thumper TL 438
Perfect for releasing greenware from sticky molds, quickly and safely.



Brushes

All Duncan brushes are carefully designed for specific applications of ceramic colors. When you use the right brush, the brush does most of the work while you enjoy the result: You can "feel" the brush working with you, and the more you practice with a brush, the easier it becomes.

Knowing what brushes are available and what their purposes are is the first step to successful brushwork. When you look at Duncan brushes, you'll notice how different they are in size and shape from one another. This is because each brush is designed for a specific application of brushstroke.

Duncan offers different levels of brushes, designed to meet the varying needs of beginning, intermediate and advanced hobbyists but they all share a common characteristic: they are designed for performance, durability and value.

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Tools and Brushes

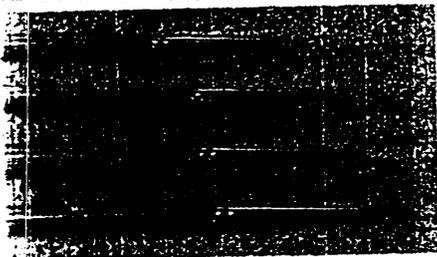
Discovery Brushes

Discovery Brushes are the versatile brushes that let you discover a fun of ceramics.

These brushes have colored handles, coded to the color of Duncan product labels. Thus, Discovery underglaze brushes have blue handles and Duncan underglazes have blue labels. Discovery glaze brushes have orange handles, like Duncan glaze labels. Discovery non-fired color brush handles are color-matched to the fired product labels.

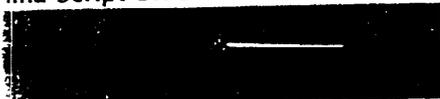
As you gain experience with ceramics, you'll find that Discovery brushes are exceptionally versatile. Beyond the basic guidance and convenience of color-coded brush handles, some Discovery Brushes can be cross-used with other products. For example, the underglaze shader brushes can be used with non-fired colors, and the non-fired product Sabeline Shader brushes can be used with underglazes.

- 1.7/0 Fine Detail BR 596
- 3.5/0 Detail BR 582
- 3.2/0 Detail BR 570
- 3.2 Detail BR 520



For fine design work, small lettering and delicate detailing, such as eyes. The brushes to use for adding tiny finishing touches!

China Script BR 521



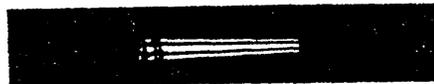
For fine detailing and lettering. A precise brush for all types of linework.

No. 10/0 Liner. BR 601



For fine decorative linework, delicate detailing and small facial features. Helps you create the daintiest brushstrokes.

✓ No. 4 Liner BR 571

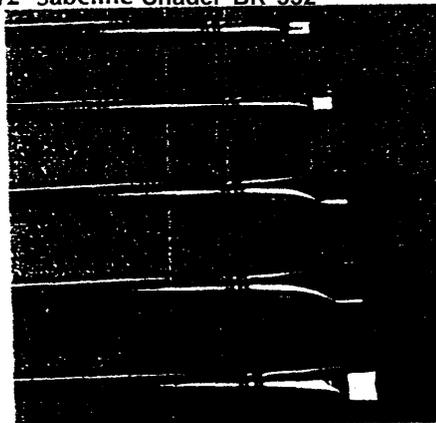


No. 6 Liner BR 583



For decorative or full-flowing lines, detail and design, lettering and features; also ideal for banding. Popular brushes for creating graceful tendrils and flourishes.

- 3/16" Shader BR 572
- 1/4" Sabeline Shader BR 531
- 3/8" Shader BR 573
- 1/2" Shader BR 584
- 1/2" Sabeline Shader BR 532



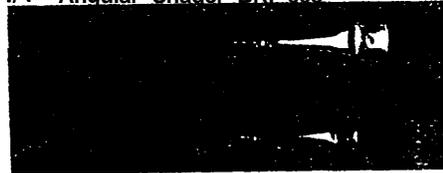
For shading, solid-color coverage, lettering, ribbon effects, varying line-widths and banding. Each brush offers two painting surfaces

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— a chisel edge for thin strokes and a flat side for broad strokes.

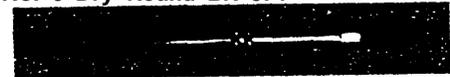
112" Angular Shader BR 602

1/4" Angular Shader BR 603



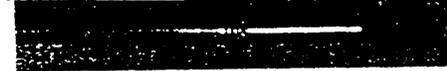
For the same brushstrokes created with straight Shaders, with the added advantage that the point reaches small areas and the points of squares and triangles.

No. 6 Dry Round BR 574



For drybrushing, design work and banding. Perfect for achieving subtle shading on floral designs!

No. 10 Deerfoot Stippler BR 592



For use in underglaze decoration when pouncing or stippling of color is needed.

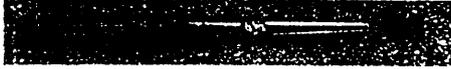
Small Sumi BR 590



For the sharp, fine lines and color washes seen in Oriental design done with bamboo brushes. Enables you to create Sumi brushwork with minimum effort!

Tools and Brushes

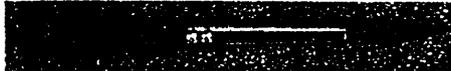
No. 4 Sabeline Round BR 529



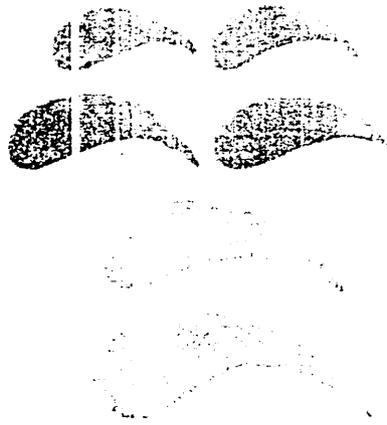
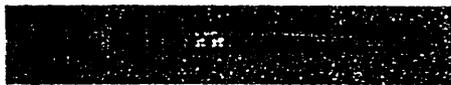
No. 6 Sabelina BR 585



No. 8 Sabeline Round BR 530

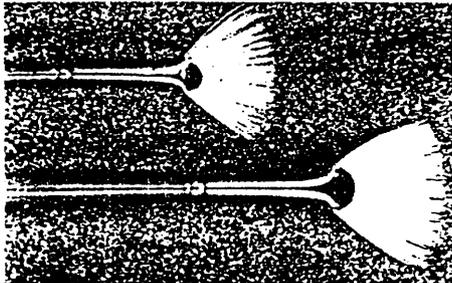


No. 10 Sabelina BR 586



For loading-and-tipping techniques, such as tole painting, and for lettering, shading, banding and solid-color coverage. These versatile brushes will help you achieve a wide variety of brushstrokes!

No. 1 Fan BR 540
No. 3 Fan BR 575



For creating textures, patterns, banding and drybrushing. The shape of the bristles makes it easy to create dramatic brushstrokes!

1/2" Stencil BR 855



3/4" Stencil BR 860



For application of color through stencils with an up-and-down pouncing motion. Especially designed for the application of underglaze and nonfired colors through Duncan Stencils.

3/4" Woodtone BR 580



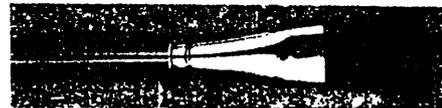
For application of Woodtone Glazes. Firm nylon bristles allow grains in the glaze to be drawn into wood-like streaks to produce realistic wood-grain effects.

3/4" Economy Glaze BR 593



For good overall coverage for glazing and opaque underglazing, large repeated patterns and design effects. Best for beginners.

3/4" Premium Glaze BR 576



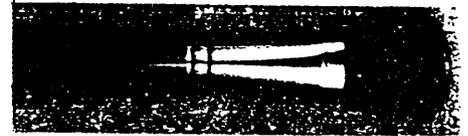
For better overall coverage for glazing and opaque underglazing, and for large repeated patterns and design effects.

1" Glaze BR 587



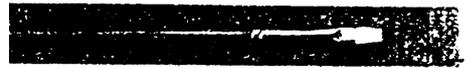
Use on larger areas for the same design purposes and glaze and opaque underglaze applications as the Premium Glaze brush.

✓ 950907 CwE 72-71
No. 10 Oval Mop BR 588



For application of glaze or underglaze to broad areas, and the same decorative purposes on a larger scale that are achieved with the Premium Glaze brush. Because the Oval Mop holds so much color, it is ideal for the application of opaque glazes to highly textured items.

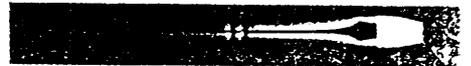
No. 1 Flat Opaque BR 554



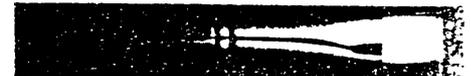
No. 3 Flat Opaque BR 555



No. 5 Flat Opaque BR 556



No. 8 Flat Opaque BR 557

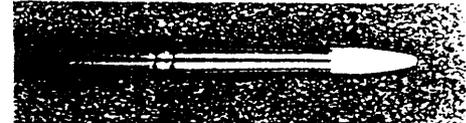


For coverage of large, smooth areas, drybrushing and shading. Ideal brushes in a range of sizes for working on bisqueware.

No. 3 Round Opaque BR 551



No. 5 Round Opaque BR 552



No. 8 Round Opaque BR 553



For solid-color coverage, drybrushing and design work. The rounded shape makes these brushes excellent companions for the Flat Opaque brushes when working on bisque.

Tools and Brushes

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1/4" Fiat Translucent BR 545



1/2" Fiat Translucent BR 559

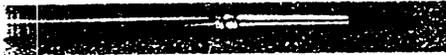


3/8" Fiat Translucent BR 558



For use on large, smooth areas, and for streaking, patterning and antiqued effects with translucent colors. Three sizes to accommodate all of your bisqueware projects.

No. 6 Round Translucent BR 560



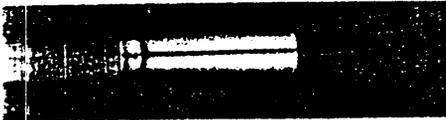
For design work and application of transluents. The brush to have for applying translucent colors to small areas.

No. 12 Mother-of-Pearl BR 594



Especially designed for applying Mother-of-Pearl Overglaze over fired glaze surfaces. The shape of the brush hairs makes it easy to swirl on Mother-of-Pearl Overglaze to a variety of ware for an opalescent finish.

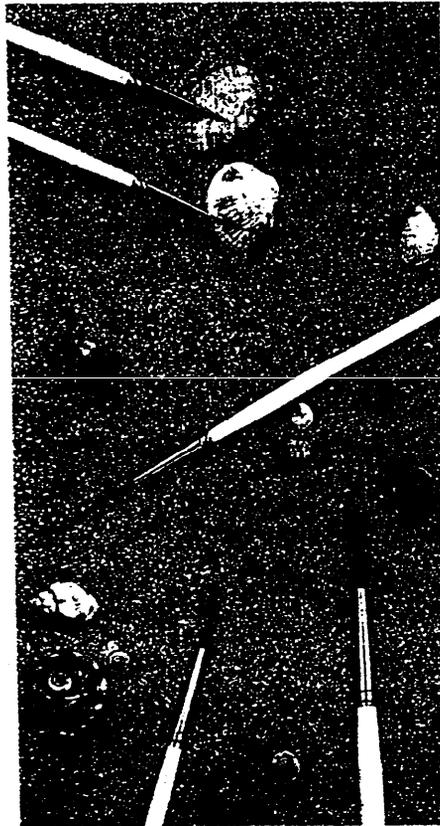
Duster BR 589



For removing dust from bisque or dry greenware, and dust or clay particles from molds.

the user to produce crisp, fine lines, extraordinarily controlled brushstrokes, and extremely smooth solid-color coverage and glaze application.

You'll recognize Debut Brushes by their white handles with a silver tip.



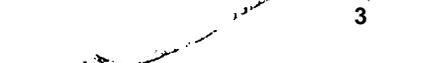
No. 1/0 Detail TB 720

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For small details and brushstrokes... the tiny final touches folk artists use to add interest to their work.

No. 10/0 Liner TB 725

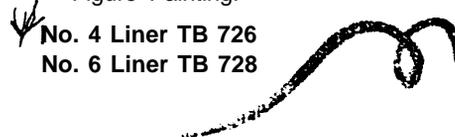
No. 1 Liner TB 727



For fine decorative linework like tendrils and cross-hatching, delicate detailing and small facial features. You'll delight in the refinement these brushes bring to techniques like French Provincial and Tyrolean Figure Painting.

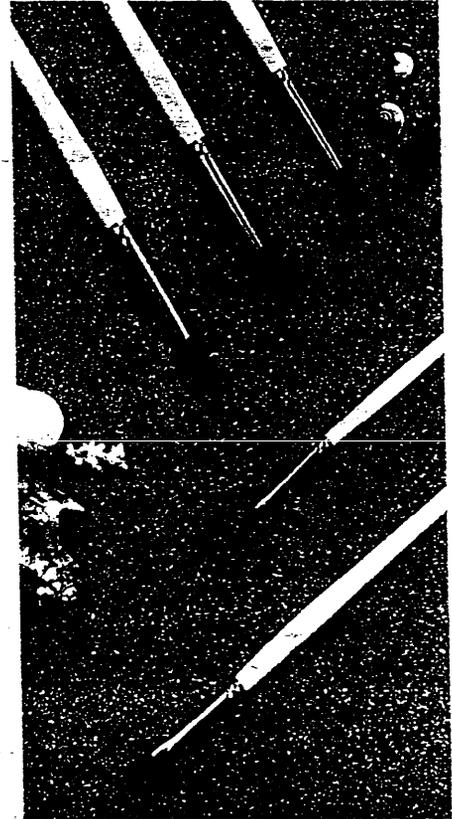
No. 4 Liner TB 726

No. 6 Liner TB 728



For linework and banding; excellent for comma strokes because the point snaps back to a

fine tip. Helps you give crisp definition to many of the basic strokes used in almost all American heritage art and tile painting techniques.



No. 5 Round TB 730

No. 7 Round TB 731

No. 9 Round TB 732

For loading-and-tipping techniques, varying strokes and long strokes for figures' clothing; ideal for bold designs, such as Russian folk art. Perfect for tipping and/or sidelading with two or even three colors for floral and fruit designs.

No. 2 Filbert TB 701

No. 6 Filbert TB 702



The traditional flat-and-round brush shape for American heritage art. For loading-and-tipping techniques, varying strokes and cursive-type lettering; excellent for blending and shading, and solid-color coverage on small areas. Essential brushes for the repeated color blending and shading that provide painterly results.

Debut Brushes

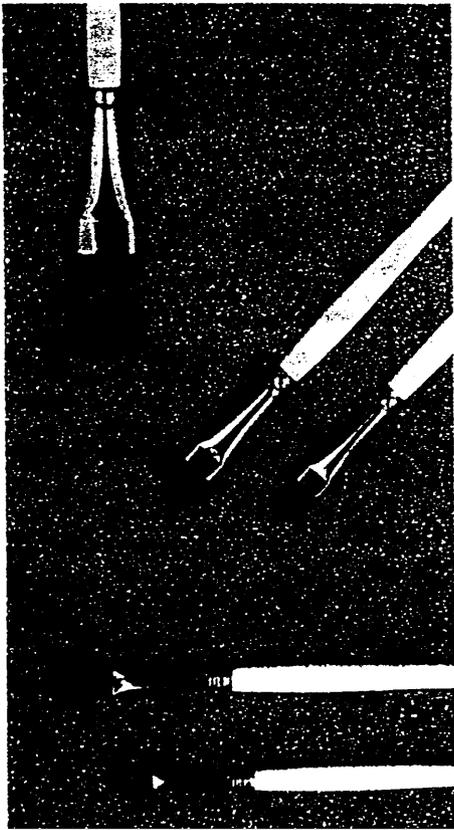
Debut Brushes offer you the control and precision needed for fine brushwork, and are especially recommended for ceramists who work with folk art and tile painting brushstrokes. Not limited to brushwork alone, the uses of Debut brushes extend to all types of ceramic decorating.

Made with Taklon fiber, Debut brushes are distinguished by firm body and shape retention that enable

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Tools and Brushes

920907CWE 7271



No. 6 Shader TB 705
No. 10 Shader TB 706



For "C" and "S" strokes, ribbon effects and shading with "floated" strokes; sharp chisel edges are excellent for lettering. The combination thin-and-broad strokes are achieved by these brushes with two painting surfaces in one: a chisel edge for the thin parts of the stroke, and a flat side for the broad areas.

3/8" Angular Shader TB 710
1/2" Angular Shader TB 711



For the same brushstrokes created with straight Shaders, with the added advantage that the point reaches small areas and the points of squares and triangles. Sheer magic for petals and leaves with fanciful edges and long tails.

3/4" Glaze TB 715

For all glazing, solid-color applications and shading; excellent for "floated" strokes on large areas. Allows you to achieve amazingly even coverage.

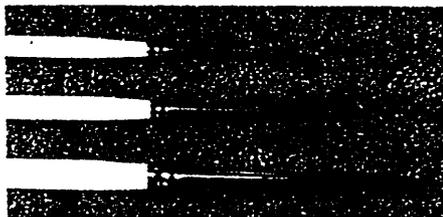
Signature Brushes

Signature Brushes are the brushes to select when you want to create the finest ceramics possible to display in your home, to show your abilities at class, and to exceed competition standards for ceramic shows.

Signature Brushes are made of 100% pure red sable hair. Rare and costly, sable is gathered from wild sable animals in Western Siberia and Northern China only in winter, when the hair is at its thickest and fullest. Natural sable hairs are longer than other animal or man-made hairs, holding the color without dripping, and they have a very fine point, letting you create a finer, more extended stroke.

Signature Brushes are handmade by master craftsmen with years of experience, and each brush must pass a careful inspection. Signature Brushes are durable. Properly cared for, these 700% pure sable brushes will perform for a very long time, making them one of the most economical brushes you can own.

You can identify Signature Brushes by their white handles with a gold tip, and the Duncan signature.

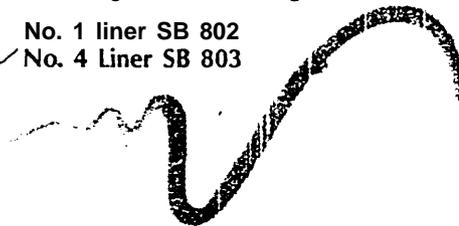


No. 2/0 Detail SB 801



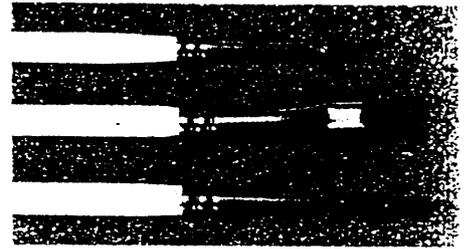
For dolls and other fine features, and for small lettering, delicate shading and slender linework. Provides the means to create distinguished detailing.

No. 1 liner SB 802
✓ No. 4 Liner SB 803



For full-flowing decorative lines, lettering, detailing, features, dolls' eyebrow and eyelash detailing, and fine banding. Enables you to create

a range of brushstrokes from elaborate designs to exacting detail ls.



No. 4 Shader SB 804
No. 8 Shader SB 805

For shading, lettering, ribbon effects, varying line widths, banding and drybrushing. Command masterful strokes for bold designs!

No. 6 Round SB 806



For smooth, even application of solid color and shaded design work; ideal for tole designs. Create dramatic flair with your brushwork!

Brush Care

Brushes used with underglazes and glazes

Wash in water immediately after use. Be sure that all color particles are removed from the area near the metal ferrule.

Brushes used with overglazes

Clean only with Duncan Essence. Any other agent may contain water or solvents which will cause separation of the overglaze during the next application. Reserve brushes for use with one overglaze only. Do not use with other products.

Brushes used with water-based nonfired products

Wash in water immediately after use. A good cleaning in Duncan Hand and Brush Cleaner should loosen any dried particles of paint and remove color stain.

Brushes used with oil-based nonfired products

Clean immediately after use by squeezing excess stain into a paper

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Tools and Brushes

vel, then cleaning with Duncan
triquing Solvent. Give translucent
ushes a regular deep cleaning
th Duncan Hand and Brush
eaner.

All brushes

Do not let brushes stand in water.

After cleaning, restore hairs and
bristles of the brushes to their original
shape, and set aside to dry on a flat
surface before storing. (Storing wet

brushes ^{430 907 C4517271} on end lets moisture run
back through the ferrule, which can
cause handle paint to split.)

Tip: Band Stencil brushes with rubber
bands to shape.

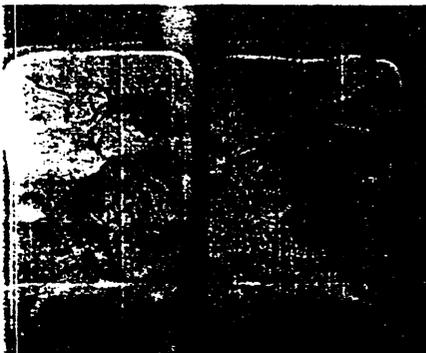
Casting a Mold: The Basic Hows and Whys

*u're in ceramics for the fun of it
d your dealer has a great selection
greenware. Do you really need to
ow how to cast a mold?*

*r most ceramists, surprisingly
ough, the answer is yes. It might
simple curiosity, the need to know
w and why things work. Or it
uld be that you want to be the
al creative force behind your
ramics. Perhaps you live in an
lated or rural area where
enware is sometimes hard to
tain.*

*u may have a practical turn of
nd and like the idea of owning the
olds for your dinnerware. If a
nce is broken, it's no tragedy if you
ve the means to replace it. Perhaps
u want to make a treeful of
ristmas ornaments in the same
sign. Or if you're a cat collector,
's say, you may want to decorate
e same cat figurine in many
ferent ways. You may have
veloped a special "signature" gift,
itcher-and-bowl set for example,
it you make for weddings and
niversaries.*

*you will be making multiple
atings, compare the cost of
rchasing the greenware with the
sts involved in purchasing and
ating your own mold.*



en mold, showing inside detail.

A ceramics mold is plain on the
outside . . . all the excitement lies
within! The inside of the mold
determines the shape of the casting. It
can be compared to a mirror or
reverse image, because the raised
areas on the casting are hollow in the
mold, just as the incised areas are
raised.

Most molds have two halves, and
every mold has one or more
openings, called pour holes, for the
casting slip (liquid clay) that will be
poured into the mold. That's why
you'll hear two terms used by
ceramists — pouring molds and
casting molds — but they both refer
to the same process.

Duncan molds are designed for
production casting and are made of
top-quality plaster. The plaster walls
of the mold absorb water from the
clay slip, producing the clay shell, or
casting.

When you decide to try casting a
mold, the following tips will prove
helpful. Be sure to read them before
you use the step-by-step directions to
cast your mold.

Tips on Mold Care

If a brand-new mold sticks together

Never pry or force apart, as this
can cause the mold keys to break off.
Proceed with your casting as usual
and the mold should separate easily
by the time the piece of greenware is
ready to be removed. If this does not
work, try gently tapping the mold's
separation points with a Duncan
TL 438 Mold Thumper.

Production casting

When pouring many molds of
various sizes, pour the large molds
first, then continue filling molds,

working from large to small. Drain
the small molds when desired
thickness is achieved. Work up to the
larger molds. Do not over cast molds.
When casting in succession, you will
find it necessary to leave the slip in
the mold a little longer each time, in
order to obtain the proper thickness.
Depending upon the size of the mold
and the thickness of the mold walls,
you can usually get from three to four
casts before the mold has absorbed so
much water that it must be allowed to
dry. Excessive casting will erode detail
and considerably shorten the life
expectancy of a mold.

Drying damp molds

*Always place mold parts together
to dry.* This will prevent warping of
the mold. Do not force dry in an
oven, or place damp molds close to a
kiln or any other direct heat source.
Molds can be sun-dried. It is
extremely important that a damp
mold dries evenly from all sides.
Drying a mold too fast can cause it to
powder, chip or warp.

Storing molds

Always store molds with the pour
hole to one side. This will allow air
to circulate inside the mold cavity. If
the mold is stored upright with the
pour hole up, dust and debris could
get inside the mold. If the pour hole
is down, air cannot get inside to dry
the mold.

How to Cast a Mold

When casting molds, there's no
better place than the kitchen, where
plenty of water is available. Casting
slip and dried clay are easily cleaned
up with a damp sponge. Cover the
work area with a plastic sheet,
oilcloth or newspaper. Assemble the

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Casting a Mold. The Basic Hows and Whys

other materials you'll need: casting slip (available from your dealer), a large measuring cup or pitcher for pouring, a TL 434 Small Trim Knife or TL 435 Large Trim Knife, drainage pan and cleanup sponge.

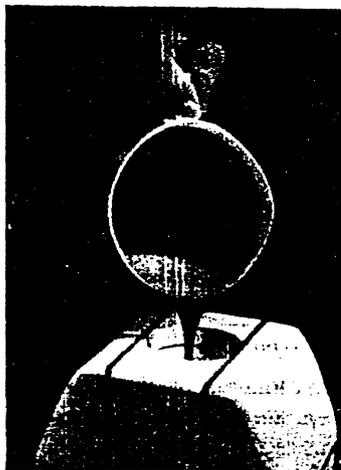
Before casting, always open the mold to check the design and to be certain there is no dust or foreign particles inside. To clean the casting area, dust with a soft, dry brush. Never use water to clean the inside of a mold, as this will damage the design. Note that cleaning the inside of any mold is especially important between castings of different clay bodies, such as changing from regular casting slip to stoneware or porcelain slip. This can be done by "flash casting"; making a thin casting with the new, different slip to pick up any traces of the last-used clay body.

Make sure all mold keys are matched, then place rubber bands or a strap tightly around the mold to hold it together. This will prevent the casting slip from seeping through the seams.

The casting slip is liquid clay and should be the consistency of thick cream. It should be stirred well just before casting and strained if necessary.

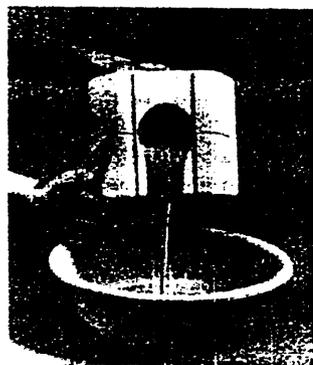
Follow the step-by-step directions below and you'll discover that casting your own molds is half the fun anti thrill of making ceramics.

1. Separate the mold, check for dust and foreign matter, dust if necessary, then put mold together, matching mold keys, and secure with rubber bands or a strap.
2. Mold is ready to cast. Use pouring container that will hold more than enough slip to fill the mold. Pour slip into mold slowly, steadily and evenly, filling the mold to the top of the pour hole.
3. The plaster mold absorbs the water in the slip, thus forming a hard clay shell next to the mold. Keep the mold pour hole full until desired thickness is obtained. Cut a notch to determine the thickness of the clay shell, which should be approximately 1/4" thick.



Pouring slip.

4. When desired thickness is obtained, slowly drain excess slip from the mold. When all slip has drained completely from one pour hole, follow the same procedure with any additional pour holes the mold may have. After draining, let the mold set until the slip becomes leather-hard. The length-of time required to reach this stage will vary depending upon the size of the mold.



Draining excess slip from mold.

5. When clay is leather-hard, remove any excess from the outside of the mold and from the mold pour hole. Take a Duncan Trim Knife and insert the blade between the mold wall and the clay.
6. Trim away and remove excess clay.
7. Remove bands or strap carefully. To open mold, slowly and very carefully lift the top half of the mold straight up. Do not move it from side to side, as this will damage the cast piece. If the top

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does not release easily, let it stand for a few more minutes.

8. Do not remove the piece from the mold until it is firm enough (leather-hard) to support its own weight. Handle the piece with care when removing it from the mold. It will be soft and its shape can be distorted if not handled gently. If the greenware is hard to remove from the mold, gently tap around the edge of the mold with the Mold Thumper. This will usually release it. If the piece still does not release, wait a few minutes until it has pulled away from the plaster mold. (With large, flat pieces such as plates or ashtrays, loosen the casting and allow the greenware to dry in the bottom half of the mold for four or five hours longer to prevent warping.)
9. When the piece is loose, gently tilt the mold forward and allow the piece to fall into your hand. If the piece has several parts to be attached, do this shortly after removing them from the mold. Attach pieces with casting slip when the clay is leather-hard. Carefully place the cast piece in a safe, dry place and allow to dry before handling again. For delicate and footed items, place greenware in a soft bed of shredded paper to dry.



Removing casting.

Casting an Open-Pour Mold

Because this type of mold has no pour holes, fill each cavity to the top with slightly thinned slip, making sure the slip fills all the crevices and that no air pockets are visible. A squeeze bottle filled with slip is excellent for this purpose.

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Casting a Mold: The Basic Hows and Whys

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- a. Yes, air pressure lifts the piece away from the mold wall.
 - b. Use air after the mold has been open for a period of time.
 - c. Air is especially helpful for flat pieces and highly detailed pieces.
5. When I opened my mold, the ware had collapsed. What happened?
 - a. The mold was drained too fast.
 1. If the pouring hole is small, drain more slowly.
 2. Listen for a gurgling sound. If this occurs, ease up on the speed of draining.
 3. A collapsed piece is caused by a vacuum while the mold was draining. Air could not enter the mold cavity.
 6. What causes hard spots?
 - a. The clay was packed tightly against the mold by the force of pouring.
 - b. To eliminate:
 1. Pour against or over a palette knife or piece of wood.
 7. How can I prevent the sinking of flat items?
 - a. Prop leather-hard ware up on its side, letting the piece dry between the props. A piece of sheet rock, another mold and foam rubber pads make good props.
 8. What causes my flat items (tiles and appliques) to warp?
 - a. The ware was dried too fast. Slow down the drying time by covering the casting with a plastic bag.
 - b. The drying must be done on a flat, even surface.
 - c. The pieces must dry uniformly, not just from the edges.
 - d. Place a piece of sheet rock over the ware to keep it flat.
 9. How can I prevent my plate from warping?
 - a. Let the plate remain in the front side of the mold. Remove the back or footed side of the mold first. The plate may need to be **released** by air pressure, then dried overnight in the mold.
 10. Many of my molds have tiny pouring holes. Is there an easy way to pour these?
 - a. Thin the slip slightly with water.
 - b. Do not cast as heavily.
 - c. Drain only if necessary. Often a tiny piece can be poured solid.
 11. I do not have forced air and my ware is sticking in the mold. What can I do?
 - a. Let the ware dry in the mold a little longer.
 - b. Try using the Mold Thumper to hit the edge of the mold. This may need to be repeated several times.

Firing Basics

When you're new to ceramics, you probably don't own a kiln and your dealer does all your firing. Your dealer, of course, knows all about firing a kiln. However, you'll save yourself and your dealer a great deal of time and discussion if you understand the process of firing a kiln well enough to request the

correct bisque and glaze firings for your ceramic projects.

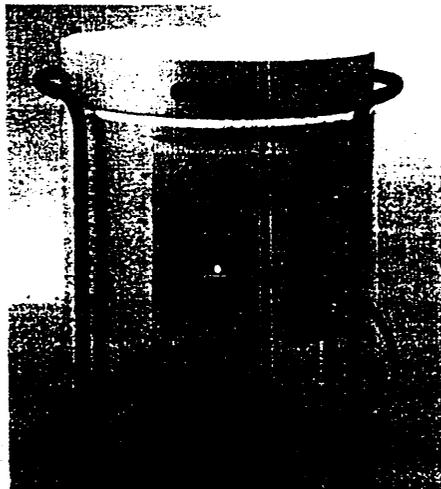
Improper firing is probably the most common reason for problems in ceramics and, when you know why you need your piece fired to a certain temperature, it's much easier to tell your dealer what you need.

How a Kiln Works

Kilns are heating units especially designed for firing ceramics. The name *kiln* comes from the Latin word for kitchen, referring to ovens. Basically, ovens and kilns work in the same manner. Cakes, cookies and meringues are baked at different temperatures . . . greenware, glazes and overglazes are fired at different temperatures. -

The term *firing* comes from the fact that kilns were originally heated with fire. Today, most ceramists use electric kilns to obtain truly consistent results, just as we use electric ranges instead of wood-burning cookstoves.

Both time and temperature play a part in the kiln firing process. You wouldn't expect good results if you baked a cake for ten minutes at 500 degrees F instead of the usual 35 to 40 minutes at 350 degrees F. In the same way, greenware and ceramic colors are fired to maturity when they have been exposed to a specific rate



The Artist and The Crafter Duncan Kilns for the Home.

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Firing Basics

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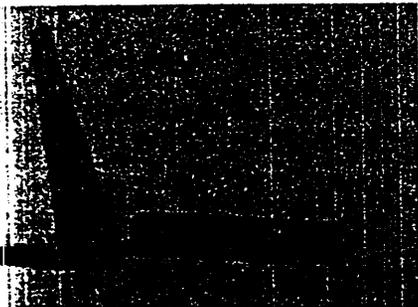
temperature increase for a certain length of time.

A kiln's firing time varies, depending upon the size of the kiln, the amount of ware in the firing chamber, the thickness of the ware and the electrical voltage variations in the area. With all these variables, a kiln cannot rely on a set temperature like the one on your kitchen oven, so pyrometric (heat measuring) cones are used instead.

Cones — What They Are and How They Work

When firing ceramic ware, a ceramist does not speak in terms of temperature but refers to a specific cone number. For example, you'll hear your dealer talk about cone 04 bisque (hard bisque) and done 06 bisque (soft bisque). There are only a few cone numbers that will cross your path — so few, in fact, that before you know it, you'll be talking about cones in relation to kiln firings as if you'd done so all your life.

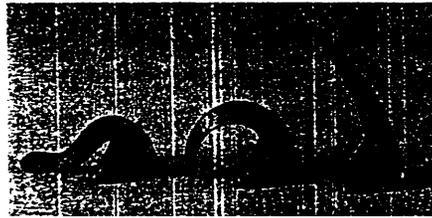
Pyrometric cones are heat-measuring devices used when firing a kiln. The most usual cone is a three-sided pyramidal form of clay and chemicals made to bend not when a specific temperature is reached inside the kiln but when it has been exposed to a specific rate of temperature increase for a specific length of time. Small pyrometric bars are also available for use in the kiln-sitter.



Pyrometric cone and bar.

Small cones are used in the kiln-sitter (a mechanical device that shuts off the kiln when triggered by the small cone) and large cones (witness cones) are placed on the kiln shelves to allow a check of the firing accuracy. Usually witness cones are

placed on each shelf in a series: a guide cone (one cone cooler than the desired cone to signal the approach of maturity), a firing cone (the cone you wish to achieve), and a guard cone (one cone hotter than the desired cone). The only way to be sure the ware or ceramic color is properly matured is to use the firing cone listed on your ceramic color label. If more than one cone is listed on your product label, refer to the chart on the following page.



Witness cones — perfect examples of overfiring (the guide cone), maturity (the firing cone) and underfiring (the guard cone).

Since different clays and ceramic colors require different firing conditions to mature properly, cones are available in a series of numbers to allow for these differences. The cone numbers commonly used for ceramic articles are shown below.

What Cone Does Your Project Need?

Type of Firing	Large Witness Cone
Bisque	
For nonfired color products	04
For Crackletone Glazes	06
For nonfired color products with glazed areas	04
For general-purpose ware	04
For Duncan Red-Stroke	03
For porcelain	6
For stoneware	6-10
Glaze	
Luster (Mother-of-Pearl)	020
Metallic overglazes	019
China paints*	019
Decals*	018
Hobby ceramics glazes †	06
Porcelain or stoneware glazes	6

* Check manufacturer's label for recommended witness cone.

† When properly fired to witness cone 06, Duncan glazes labeled as dinnerware safe comply with the Food and Drug Administration's safety requirements concerning lead and cadmium release.

Be aware that the lower the cone number, the cooler the firing, and vice versa. Thus, numbers prefaced by zero (cone 05, for example) are cooler than numbers which stand alone (such as cone 5). Heat increases as the cone numbers increase — cone 06 is cooler than cone 05, and cone 6 is hotter than cone 5.

Note: These are general guidelines. Always check the specific product label for recommended witness cone.

Witness Cones — Your Key to Success

As you see labels, decorating instructions and other references to firing cones, you'll notice that the words witness cones are used.

What are witness cones and why do we use them?

There are two major types of cones. Kiln-sitter cones are the first type. These are small cones in either a pyramid or bar shape. One of these cones goes into the kiln-sitter, which is the reliable device that shuts a kiln off when the desired firing temperature is reached.

A witness cone is a larger cone that is put on a shelf to measure the exact temperature reached on that shelf.

To understand the importance of witness cones, we must recognize that all kilns, regardless of who makes them, have some internal variation in temperatures. Each kiln is different and has its own personality. It's this variation that results in "cold spots" and "hot spots."

The sitter-cone will shut off the kiln when the selected temperature is reached at the spot where the sitter-cone is located. This is no guarantee that the rest of the kiln also reached that cone. The only way to be sure your piece has reached the desired cone is to have a witness cone on the same shelf with the piece.

While most glazes and stains can handle some variation in cone temperature, more extreme variations in a kiln can occur. This is especially true if the kiln-sitter needs adjustment; a condition that sometimes is difficult to notice. An

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Firing Basics

extreme temperature variation that results in an under-fired or over-fired piece can cause the colors to not perform properly.

To ensure that your piece is fired

adequately, ask that your dealer use witness cones.

If you have to, offer to supply them for your pieces. They are available at most ceramic supply shops and are

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quite inexpensive. Witness cones are very cheap insurance to make sure the piece you've just spent hours on comes out fine.

Duncan Educational Services Seminar Program

long ago, Erma Duncan, the founder of Duncan Enterprises, discovered that the more she learned about ceramics, the more she wanted and needed to know.

This thirst for knowledge about the products and materials you use is the hallmark of creativity, a sure sign of the artist.

As you become more interested in ceramics and want to try more decorating techniques, you'll benefit from the Product Orientation Sessions offered by the Duncan Educational Services.

Product Orientation Sessions

These one-day sessions are open to the public, as well as to dealers and teachers, so you're invited! Contact your local Duncan Distributor, listed in your telephone directory and in major ceramics magazines, to register.

Each session introduces and teaches a major product line or decorating technique. You'll be thoroughly informed and receive the benefit of in-depth teaching on each exciting topic.. imagine what more expertise will do for your ceramic projects!

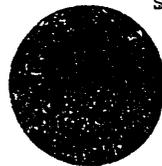


You'll get a handsome certificate of completion to frame and display. Proof of your accomplishment is awarded at the end of each Product Orientation Session. Certified Duncan Teachers earn a half plaque and a half credit toward their Shield Club and Erma Duncan Awards.

Teacher Certification Program

Open to anyone interested in gaining a strong background in Duncan product knowledge or considering a career in ceramics

For your own personal growth as well as for gaining valuable in-depth knowledge of ceramics, you'll want to benefit from attending the basic Teacher Certification Seminars. And if you're thinking of opening a home studio or expanding to a retail storefront, a sound ceramics education will prove a firm foundation.



All Certified Duncan Teachers are eligible to wear this pin.

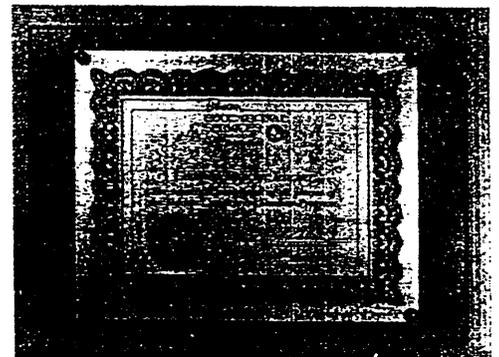
The Duncan Teacher Certification Program is made up of four two-day seminars. All projects in all four sessions are practical projects that cover using all of the basic products. In addition to sound and complete product knowledge, you'll learn about casting molds, cleaning greenware, kiln firing, appealing new trends and more.

Besides the best ceramics education available, you'll benefit from the latest in teaching methods.

You'll be taught by the best — knowledgeable, professional Duncan Seminar Ambassadors!

All project sheets, color sheets and all Duncan colors are provided. Registration is through your local Duncan Distributor. A list of necessary greenware, bisque, brushes, etc., will be available at the time of registration.

A test-review is given at the end of each session, and those who pass are awarded their all-important Certified Duncan Teacher Certificate.



Teachers' Seminars

Having fun keeping up with your "graduate" studies is a sure way of continuing to enjoy ceramics!

Once you're a Certified Duncan Teacher, you can enroll in any or all of the valuable Teachers' Seminars that emphasize more advanced techniques than the basic Certification Seminars. Teachers' Seminars are updated yearly to keep new ideas flowing!

Teachers' Seminars are exclusively for advanced *ceramists* and are open only to Certified Duncan Teachers.

Project sheets, color sheets and all Duncan colors are provided. Registration is through your local Duncan Distributor. A list of necessary greenware, bisque, brushes, etc., will be available at the time of registration.

For each Teachers' Seminar you complete, you get proof of your

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Duncan Educational Services Seminar Program

accomplishment to hang below your Certified Duncan Teacher certificate.

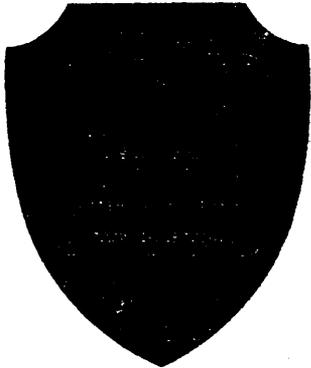
The handsome Shield Club Award represents a truly impressive achievement and inspires confidence in students and customers.

enamel and ruby pin with gold lettering and rim, and a ceramic plaque personalized in fired gold . . . proof of your unique ceramics expertise!

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Shield Club

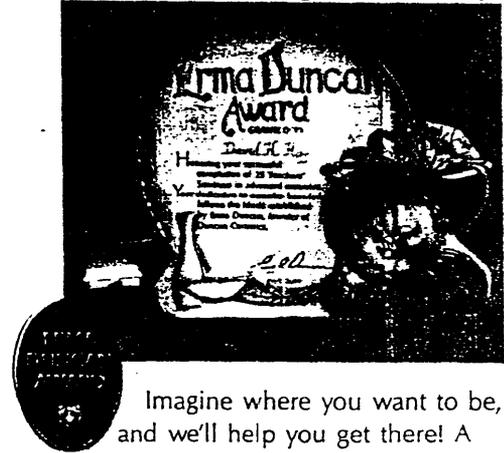
Membership in the Shield Club is automatically awarded to Certified Duncan Teachers who satisfactorily complete ten Teachers' Seminars.



The Erma Duncan Award

The "Ph.D." of ceramics knowledge! Granted to Certified Duncan Teachers upon satisfactory completion of 25 Teachers' Seminars, the Erma Duncan Award recognizes those who have the same devotion to the pursuit of excellence and advanced knowledge as Duncan's founder.

The proudest achievement possible today for ceramics professionals is recognized with a beautiful black



Imagine where you want to be, and we'll help you get there! A career in ceramics can change your life!

Planning Your Project

Once you've finished your beginners' ceramics class or have made some practice pieces, you'll be eager to fly alone. Planning a ceramics project is always exciting, whether it's your first independent project or the next one you're thinking about doing after you've completed the one in hand. The more of yourself you put into a project, the more your ceramics will express your personality and creativity, so planning is important.

Selecting Greenware

Perhaps you've decided to make decorations and gifts for the holidays, a canister set for your kitchen or a beautiful gift for a wedding. The first step is to find greenware that appeals to you. Hundreds of greenware designs are always available, and Duncan introduces between nine and 15 new designs each month. Greenware designs are like clothing. Some are seasonal, some are classic styles and still others are fashionable and fun.

The easiest and most efficient way

to select your greenware is to consult the latest edition of The Duncan Mold Catalog. This big book displays all the new and current Duncan mold designs, conveniently separated into different categories. It shows color photos of decorated ceramics to give you a better idea of how the finished piece will look.

For example, let's say you want to make a lamp for your living room. By turning to the lamp section in the catalog, you'll see all the Duncan lamp designs. You'll also notice that other large greenware designs, such as cookie jars and pitchers, can be made into lamp bases. To make your choice simpler, the largest dimension for each design is given along with the order number and name. After you've selected a lamp base, write down its number and name on your project-planning sheet or shopping list to take to your ceramics dealer's studio.

Another way of selecting greenware is to browse through your ceramics dealer's greenware shelves. There you'll have the advantages of seeing the actual items, although it may be

more difficult to visualize how they will look when decorated.



Greenware shelves in a ceramics studio offer a wide variety of beautiful pieces.

In the end, you'll probably be happiest with a combination of both methods. Get an idea of what you want from *The Duncan Mold Catalog*, then confirm your selection by looking at the actual greenware piece.

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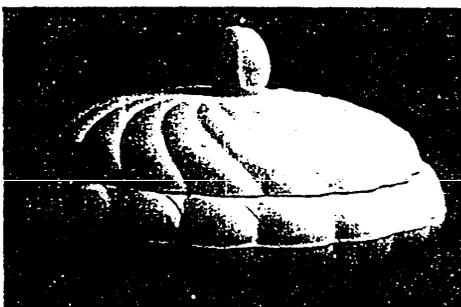
Planning Your Project

It should be mentioned that serendipity — the faculty of finding valuable or agreeable things you're not looking for — often does play a big part in greenware selection. Perhaps you'll find an item exactly like something your mother had when you were a child or a cute teddy bear or a charming country item on your dealer's greenware shelves. Instantly you know you have to make that piece. It's just right for your home or for a gift.

Spontaneous greenware selection of this type happens all the time. It's one of the reasons why it's fun to visit your ceramics studio and check out what's new. But, to make your happy find match up to your vision of it, you must continue the project-planning process.

Cleaning Greenware

Careful attention to proper greenware preparation is all important for finely finished ceramics. Greenware comes with seam lines created where the halves of the mold join together. Preparing or cleaning the greenware are the terms used for removing these seam lines and other small imperfections from the greenware before it is decorated or bisque fired.



Greenware box with uncleaned seam line.

Never hurry or skimp on greenware preparation. Any little flaws you let slip by will seem greatly magnified after your piece is glazed and fired or decorated with nonfired colors.

Before handling greenware, be sure your hands are free of any oil, hand lotion or salt. Salt (table salt, from crackers, chips, peanuts, etc.) is deadly to certain glaze colors. It will cause the color to bleach out almost completely and there is absolutely nothing that can be done to correct the defect. The oil and lotion can

create spots on the greenware which will later reject glazes.

Wait until your greenware piece is bone-dry before cleaning. Handle greenware with care as it is very fragile and easily broken. The flat blade of a cleanup tool can be used to remove most of the seam line. Depending on the size and depth of the ware, use TL 401 Cleanup, TL 413 Large Cleanup or TL 413 Deep Cleanup tools. Using short, gentle strokes, scrape *diagonally* across the seam line, until it is level with the surface of the ware. Do not cut into the surface. Save the dust from this cleaning in a clean container for use in repairing some greenware imperfections. A piece of grit cloth or a sponge-backed sanding pad can be used for the final smoothing out of seam lines, using a circular motion whenever possible. Also smooth or round off any sharp edges on the piece. For smoothing hard-to-reach areas and hidden crevices such as the inside of a cup handle, the TL 412 Double Spiral tool is very helpful.



Scrape diagonally across seam line to remove.

If there are any other casting imperfections or pin-sized holes in the greenware, smooth out by rubbing the surface lightly with a grit sponge. Another way to repair pinholes is to moisten a brush in water, dip it in the container of dry dust saved from cleaning and then brush across the pinhole. Smooth all repair work to the exact level of the greenware surface. When all smoothing is done, use BR 589 Duster brush to brush away all clay dust from the piece.

Finally, a light damp sponging is done over the smoothed areas. Thoroughly wet TL 415 Sponge in clean water, squeeze it as dry as possible and wipe over the smoothed

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areas in one direction, usually vertically. Do not over sponge as this may create a rough or sandy texture on the surface of the piece or -could cause a hard spot from over polishing. Sponge detailed areas lightly, as over-sponging can cause these areas to smooth out and lose their sharp detail. If a sponge is too large to reach into some of the cleaned areas, use a small damp brush. Dampen TL 414 Long-Handled Sponge and use it to sponge the inside of the greenware. This sponge is also useful for cleaning the inside surfaces of large or deep ware. Always keep your sponge or brush clean. Do not heavily sponge greenware if you intend to decorate it with an antiquing wash, as the sponged marks will show up when your color is applied. Polishing with a damp sponge tends to seal the pores of the greenware which makes the ware resist washes and other ceramic finishes.

Choosing the Right Colors

When you look at the current *Duncan Tile Color Chart* or *Duncan Color Selection Guide*, you see literally hundreds of beautiful colors and, like most artists, you want them all! How do you narrow down the choice to those you need for one project?



The Duncan Color Selection Guide helps in selecting colors.

Be clear about the purpose of your ceramics project. Are you making it for yourself or for a gift? Will it be primarily decorative or functional both? Is it a home accent or personal jewelry? Do you want the look of a certain type of fine collectible or are you adding another piece to an

Planning Your Project

isting collection? If you're planning a holiday project, do you want additional colors or "something different"? What decorating technique do you want to use — one that's basically the application of color or one that calls for the use of specialty products?

By defining your project in this manner, you automatically gain a better understanding of both the type of color product and the actual colors you want.

If the project is for yourself, your tastes are of paramount importance. Going back to our example of a living room lamp, you may already know whether you want it to echo a color or design from some other project in the room or whether you're looking for a new accent color to add to a ho hum color scheme. Trust your own instincts on anything you like for yourself. It's your home and you want jade green accents in a room that's mostly pale blue, you'll see the result.

What if you aren't sure about the effect you want? Then you can enjoy the fun of leafing through home decorating magazines and interior decoration books from your public library until you find something you

Have you ever taken a magazine picture of a hairstyle to your beauty operator and said, "I'd like to try this"? You can do the same thing with ceramics. If you show a picture of a ceramic piece to your dealer, he or she will be able to tell you what types of color products and what decorating technique were used.

On the other hand, if you're making a gift, you'll want to consider the personal likes and dislikes of the recipient. A friend with a cozy country kitchen probably will not want a sleek, shiny black teapot. If your sister collects blue-and-white dishes, make her more of the same. People dearly love being recognized as individuals. When you notice their preferred color choices and styles, then use them for custom-made, truly personal gifts, they'll appreciate your — and you — all the more.

Decorative items can be made with any type of color product. Beauty, design and effectiveness are what you're after. A figurine can be

decorated very realistically with underglazes; dramatically with any one of hundreds of ceramics techniques like antique metal or marbleizing; or with a Duncan nonfired color technique.

For practical utility items, the function must be taken into account. A dinnerware set can be decorated with any type of underglaze technique, from country spongeware to Oriental Sumi brushwork — or with no underglaze design work at all — but the finishing glaze *must* be dinnerware safe.

What about your lamp base? It's both decorative and functional, but since its purpose is to contain electric lamp parts, you can treat it as a decorative item and use either fired or nonfired colors. If you decide to use a straight glazing technique, the glaze need not be dinnerware safe. The choice of color products will not affect your lamp's function.

Let's imagine that you've used designs in Bisq-Stain Opaque colors to decorate items for an entire room. You've made a pair of lamp bases and painted the same design on the lampshades. You've applied the same design to the fabric covers of throw pillows. Now you'd like to make a matching vase. Can you do it? The function of a vase is to hold water, so the inside of the vase must be waterproof. That calls for a glaze. The solution is to use a clear or colored glaze inside the vase, and decorate its outside with the designs in Bisq-Stain Opaques.

Then there's another category of decorative and functional items that you'll want to consider. Ashtrays are subjected to heat and you'll want to be able to wash them. A glaze finish is the answer. Candy and nut dishes should have a dinnerware-safe glaze finish on the food-contact surfaces, but you have the option of using fired or nonfired colors on the outer surfaces. It should be noted that Bisq-Stain Opaques, when properly used and sealed, can be washed, but they are water-resistant, not waterproof.

If you want a certain "look" — the pale pastels of the popular Danish and Spanish collectibles, for example, you'll want to use the correct technique and appropriate colors. In this case, it would be light tones of

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Cover-Coat opaque underglazes and GL 679 Royal Danish Gloss Glaze. Or perhaps you're adding a new greenware design to your collection of animal figurines airbrushed with E-Z Stroke translucent underglazes. So the new figurine will match the others, airbrush it with appropriate E-Z Stroke colors also.

Holiday items are always wonderful gifts because everyone wants them and the traditional colors are acceptable to nearly everyone: However, if you know that a friend prefers pastels and takes great pride in her collection of pink Christmas tree ornaments, don't give her things decorated with red and green. Give her what she wants, give her something pink. If your sister prefers plain white dishes, there's no reason to spend time decorating a turkey serving bowl so realistically you can almost hear the bird gobble. Use a clear Gloss Glaze and thrill her with a hard-to-find white turkey bowl!



Ceramics lets you create uniquely personal home decorations and gifts!

Each ceramics project you make has the potential to be uniquely personal. You can select from hundreds of decorating techniques and increase them to thousands of individual looks with your own approaches to color and design.

For beginners in ceramics, the best way to start learning decorating techniques is through your dealer's studio classes. After you become more knowledgeable about color product usage and decorating terms, and more experienced in following step-by-step directions, you can work independently from projects in Duncan's **Let's Do Ceramics** project

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With Design-Coat Versatile

sheets and hobby ceramics magazines.

Magazine projects often include a list of the color products, brushes and other items you'll need, so color selection may not be a concern. For instance, if you're using a simulated jade technique, you must use the specified colors in order to obtain the jade effect. Sometimes, however, you may find a magazine project with a greenware design and decorating technique you like but with colors that do not suit your purposes. In this case, you can substitute other colors within the same color family. If you have any doubts, ask your dealer's advice.

Duncan videos offer a great way to learn ceramics decorating methods in the comfort of your own home. It's like having a very helpful and patient teacher who explains and demonstrates aspects of the decorating or brushwork technique over and over until you've mastered it. Duncan offers a selection of videos covering many subjects, including easy eye painting, brushwork and specific decorating techniques.

Now that we've reviewed some of your options, we can get back to the actual selection of colors. Whatever color medium you've decided to use — underglazes, glazes, overglazes or nonfired colors — you can see all the available colors on the current *Duncan Color Selection Guide*. This convenient color chart brochure fits into your handbag, so you can carry it with you wherever you go. Use it to match ceramic colors to your home color schemes and to check out matching or complementary colors when you're shopping for fabrics, table linens, towels, glassware and other home decor items.

While we use the optimum state-of-the-art printing processes to reproduce the ceramic colors in the brochure, tile samples of ceramic colors will give you an additional checkpoint. Visit your ceramics dealer and look at the real ceramic tiles contained in the Duncan Tile Color *Chart*. If, for any reason, you do not have access to a tile chart, you can make your own small fired-test sample for underglazes and glazes. Since Duncan nonfired colors dry color-true, the color you see in the jar is the color you'll get on your finished piece.

If you have any doubts about color selection, by all means consult your dealer. Studio owners are very knowledgeable about color products and their range of uses. If your dealer is a Certified Duncan Teacher, he or she is thoroughly trained in the versatile uses of ceramic products and you will receive proper help and advice. Look for this certificate. It's your assurance of quality instruction.

Studio Firing Services

Ceramics studios offer much more beside greenware, colors and other supplies. An essential part of every ceramics project is firing in a kiln. The firing process is often compared to baking in an oven because the result in both cases is the same. The cake batter or the raw clay or ceramic color is transformed by time and temperature into a baked or fired item. There are several types of firing. Your ceramics studio provides a complete range of firing services.

Bisque firing

This is the term used for firing greenware. The cleaned piece of greenware is placed in a kiln and fired to a very high temperature which transforms the raw clay from a grey to pure white, and into a strong, durable piece of porous ceramic ware.

You should be aware that, if you do not want to clean your own greenware or do not wish to decorate fragile greenware, you may be able to order your ceramic design as bisqueware. This can also be a time-saver when you are in a hurry to finish a project.

If you decide to decorate bisque instead of greenware, choose colors and techniques that can be used on bisque.

Duncan's nonfired color products are especially designed for use on bisqueware, and there are hundreds of fascinating decorating techniques to try. A nonfired color project requires only one firing — the bisque firing. The only exception to this is if you want part of the items, such as the inside of a vase, to be glazed. In this case, your piece will need both a bisque and a glaze firing before you decorate it.

Underglazes, almost all underglaze techniques can be done on bisque with superb results. For other underglaze colors, refer to the color-family information section of this manual for techniques that permit application on bisque.

Perhaps you've decided to decorate greenware with 'underglaze colors. When your underglaze work is completed, pack your fragile greenware item carefully in a box with shredded newspaper and take it to your ceramics studio for bisque firing. Your dealer will enter your name and the item in a customer firing record book, and will tell you when the-fired piece will be ready for pickup. There is a small fee for each type of firing service.

Glaze firing

This is the next firing step. After you have applied a glaze to your underglaze decorated or plain bisqueware, take it back to your dealer for glaze firing. This firing melts the various ingredients of the glaze and transforms it into a beautiful, hard, glass-like surface.

Overglaze firing

An additional firing is necessary if your ceramics project includes the use of metallic overglazes or Mother-of-Pearl luster.

Porcelain and stoneware firings

-These clay bodies require firing to a much higher temperature than the usual ceramic clays. Your dealer must fire your porcelain or stoneware pieces in a separate kiln load, and the firing fee may reflect this special service.

Proper kiln firing is all-important for good results with your ceramics projects. *Underfiring* produces immature bisque which, in turn, results in problems during the glaze firing. Some dealers post signs assuring their customers that they use witness cones as guides for correct firing. Be sure that your dealer is as interested in achieving the best possible fired results as you are. Here again, your best guide to reliable firing service is to make sure that your dealer is a Certified Duncan Teacher, a person who knows the firing requirements for all Duncan products.

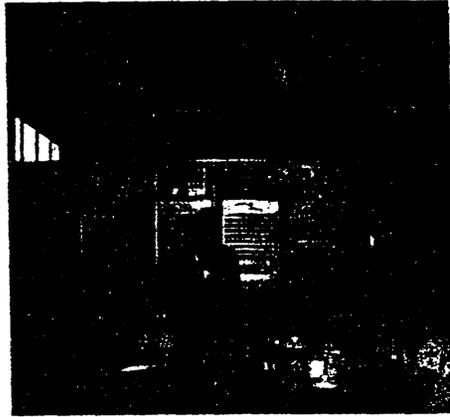
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Planning Your Project

Educational Opportunities

After you've been doing ceramics or awhile, you may decide ceramics is your life's work as well as your favorite hobby. If you want to expand your knowledge of ceramics, you'll want to learn from the best — knowledgeable, professional Duncan Seminar Ambassadors.

The Duncan Educational Services offers the basic Teacher Certification



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Seminars, advanced Teachers' Seminars and Product Orientation Sessions through Duncan Distributors. For more information, refer to the Duncan Educational Services section.

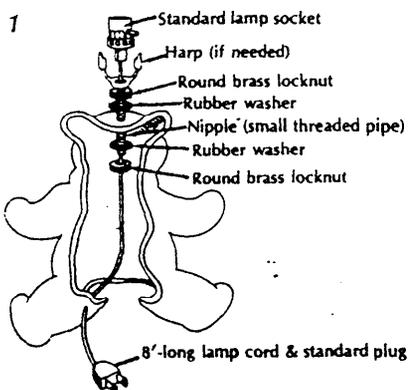
See how far ceramics can take you? Once you start planning your own projects, learning more about ceramic products and using hobby ceramics magazines, you'll gain a lot more fun and satisfaction from your hobby, and you may even be on your way to a career in ceramics!

Wiring Lamps and Christmas Trees

Let's throw some light on how to assemble various types of lamps. We've included a few helpful diagrams as well as tips on the basics of wiring.

Ceramic lamp designs are available in a broad selection of sizes, shapes and styles. Some have bases and lids, and some have lids but no bases. Christmas trees with small colored lights are also very popular.

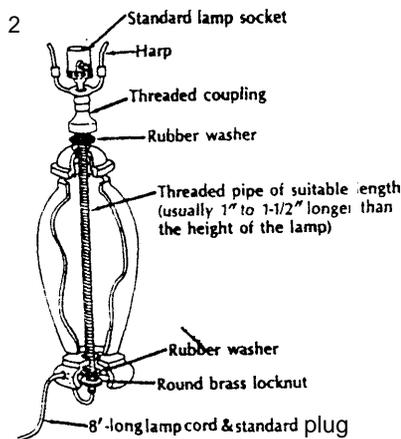
The following information will help you save money on the costs of having a lamp shop or an electrician do the wiring. You'll feel very accomplished when you can say, "I made it myself and did the wiring, too!"



Figurine Lamp

To transform a figurine into a lamp, cut a 1/2"-diameter hole for the threaded pipe in the top of the figurine and a smaller hole for the

lamp cord slightly above the base. This type of wiring also works well for jar-style lamps with lids and no separate bases. Attach the socket assembly to the lid, run the wire through the lamp and attach the lid to the lamp base with silicone adhesive (also see diagram 3).

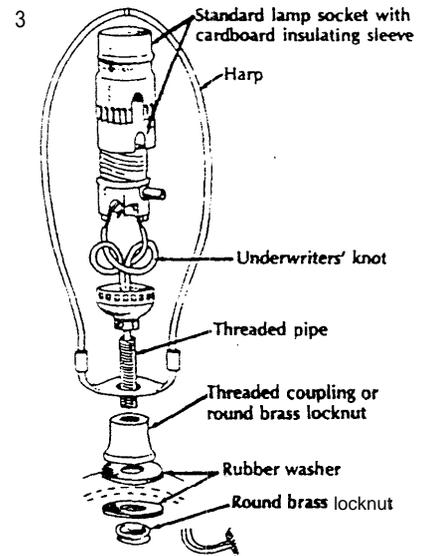


Lamp with- Lid and Base

Assembling and Wiring a Standard Lamp Socket

Remove the outer shell of the socket (including the cardboard insulating sleeve inside the shell) by pressing at the base and pulling it straight up.

Feed the free end of the cord up through the lamp base and threaded pipe.



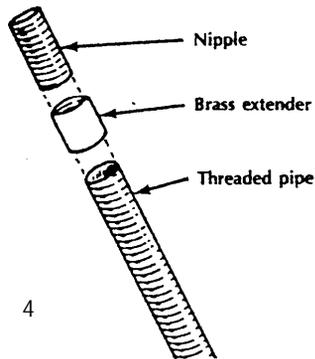
Separate the two strands of the lamp cord and, if necessary, use a sharp craft knife to remove the plastic covering from about 1" of each strand of wire. Tie an underwriters' knot (see diagram 3) to take the stress and strain of pulled wires.

Unscrew the terminal screw on each side of the socket and twist the bared wire clockwise around the shaft of the screw, making sure no wires extend from under the screw.

Retighten the screws to secure the wires. Replace the cardboard insulating sleeve and outer shell on the socket.

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Wiring Lamps and Christmas Trees



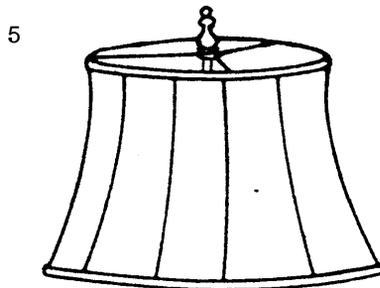
How to Lengthen a Threaded Pipe

If you are wiring a very large lamp or can't find the correct length of threaded pipe, all you have to do is add an extender (which is threaded on the inside) to the top of the threaded pipe and attach a nipple. Nipples come in various lengths and one is sure to fit your lamp.

Tips

If your threaded pipe is too long, add a coupling just below the harp. This will give the socket added height. Or better yet, use a metal hacksaw and cut the extra length off.

Save, save, save! If you don't need the part right now, you will probably use it later. Save any extra parts from old lamps . . . they'll come in handy.



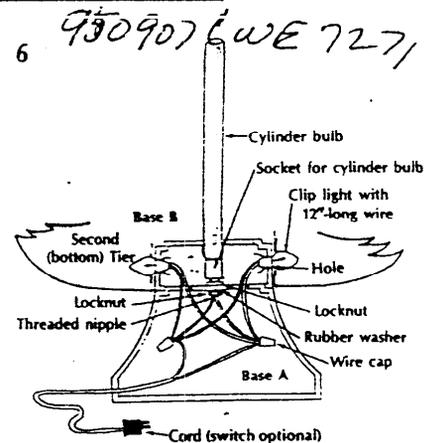
Finials

Add the professional finishing touch . . . a plain or decorative finial. The finial is attached to the top of the harp above the center metal ring of the lampshade and secures the shade in position.

Special note: In most cases, the lampshade should line up about 1/2" above the ceramic piece, thus hiding the socket assembly.

Christmas Trees

Duncan's Christmas Tree (DM-144A, 166F, 174A and 1678) with holes cut in the boughs for small plastic Christmas tree lights is wired in the



base, and a 9"-long bulb is used to throw light through the small plastic bulbs. Two small clip lights are used to illuminate the larger tier of boughs at the base of the tree.

Following diagram 6, drill three evenly spaced 1/2"-diameter holes in the top of base A, creating one hole in the center of the base and one hole on either side of the center hole. Drill a 1/2"-diameter hole for the cord about 1/2" up from the bottom of base A. Drill one 2-1/2"-diameter hole in the top center of base B. Drill two 1-1/2"-diameter holes on opposite sides of base B. In the larger tier of boughs, add two 1-1/2"-diameter holes that align with the side holes in base B.

Follow diagram 6 to assemble bases with lamp parts.

Possible Problems

Occasionally, the ceramist's knowledge of what to do needs to be backed up with an awareness of what not to do. This section covers the most common problems, their causes and, in some cases, possible solutions that may let you salvage the piece.

Practices to Avoid

Using underfired bisque

Immature or underfired bisque is the one major cause of flaws and defects in the fired glaze finish. Crazeing, pinholes, craters, bare spots and greying of colors are just some of the problems where underfired bisque can be the main cause or a contributing factor. For best results,

apply glazes to bisque that has been fired to witness cone 04. Some exceptions to this rule are Crackleton Glazes, which are applied to witness cone 06 bisque; Red-Stroke Clear Glaze used over Red-Stroke translucent underglazes, which are applied to witness cone 03 bisque; and some of our nontoxic glazes which are applied to harder bisque (always refer to the jar label).

-Applying colors to dirty bisque

A dusty bisque surface can result in problems such as bare spots, crawling and pinholing in the fired glaze finish. Because dust can accumulate on bisque stored on open shelves, make it a habit to damp sponge your bisque for a final cleanup before applying a glaze.

Firing glazes on greenware

Firing glazes on greenware is an unsatisfactory shortcut to a finished object and, more often than not, will produce a less than perfect finished piece. Gases are released from the clay when bisque firing greenware. If you applied a glaze over the greenware, these gases would be released through the glaze. This could cause imperfections in the glazed surface. Clay bodies across the country differ from one another and although a manufacturer can perfect a glaze that will perform beautifully on a greenware clay body which is available in his locality, there is no way to guarantee that it will do the same on all clay bodies.

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Possible Problems

Firing greenware and glazed bisque items together

Moisture in a kiln will often contaminate certain glaze colors. For this reason, separate firings are always recommended for greenware pieces and glazed bisque pieces. Moisture, along with the gases, is always found in a greenware kiln firing.

Firing incompatible glazes together

When incompatible glazes are fired together, fumes and sputtering from one glaze can cause another glaze to fade in color or acquire black spots. With Duncan's product labeling system, it is very simple to avoid firing incompatible glazes in the same kiln load. Copper-formula glazes which contain small amounts of copper for color are labeled **COPPER-FORMULA GLAZE**. There are a few other Duncan glazes that, because of their formulation, should not be used or fired with copper-formula glazes, and these glazes are identified on the label by **DO NOT FIRE WITH COPPER-FORMULA GLAZES**. Always check the labels of the glazes you use.

How to Recognize Problems

Cloudy colored glaze

Several conditions can contribute to this result. Be sure the brushes used are absolutely clean. Allow enough room between the glazed pieces to prevent the fumes of one glazed article from flashing to another article, thus leaving a discoloration. Avoid placing ware too close to the kiln elements as this, too, will cause a discoloration. Most importantly, make sure the proper witness cone has been achieved for the glaze firing.

Cloudy transparent glaze

This is often due to the glaze being applied too heavily or not being fired hot enough. Try refiring one cone hotter to reduce the cloudy appearance.

Cratered or bubbled glaze

Craters or broken bubbles can be seen in the fired glaze surface. These are most often caused by too thick a glaze application, underfired glaze, or underfired bisque, which continues to

release gases up through the glaze during firing. It is occasionally possible to salvage a piece by grinding down the bubbles, adding another coat of glaze and refiring to the proper cone.



Cratered or bubbled glaze.

Crawled glaze

This refers to bare areas that appear after the glaze firing where the glaze has "crawled away" from the bisque. It is often caused by too heavy an application of underglaze, oil from the skin, accumulation of dust on the bisque, or hard spots in the bisque. Hard spots are impact areas caused by pouring slip into the mold too fast or sealed or polished areas caused by oversponging the greenware during cleaning. Sometimes applying 3 coats of glaze to the bare spots and refiring to witness cone 06 will correct this condition. If refiring does not correct the crawled condition, you can apply a texture-type glaze or a glaze combination for an unusual and different effect, and thereby possibly salvage your piece.



Crawled glaze.

Crazing

Of the several different defects that can occur in ceramic glaze work, crazing is one of the most common problems. Crazing is best described as a network of fine hairline cracks that appear in the glazed surface of a finished ceramic piece. Crazing is usually caused by underfired or

immature bisque, cooling the kiln too rapidly, thermal shock (removing piece from kiln too soon or subjecting it to extreme temperature changes), or incompatibility of the glaze to the clay body or vice versa. When crazing is occurring, the pinging sound of the surface cracking is quite audible and continues for some time until the object is stone cold. Crazing can take place at two different stages in ceramics. Crazing at the time the object is removed from the kiln or shortly thereafter is referred to as immediate crazing. Crazing that takes place days, weeks or months after the glaze firing is referred to as delayed crazing.

immediate crazing

This is most commonly caused by under-fired or immature bisque. The cause of delayed crazing is the same, but to a lesser degree. The glazes used in hobby ceramics are designed to fit a clay body that has been properly bisque fired. Mature bisque always contracts more on cooling than does immature bisque. This allows the glaze to "fit" the ware without being stretched. Since immature bisque has less contraction, the ware, in effect, is larger and this puts a stretching stress on the glaze. Because a glaze cannot tolerate being stretched, it tears (crazes). Immediate crazing can also be caused by cooling the kiln too quickly. When the lid of the kiln is raised or even the peephole plugs removed before the kiln is cold, the outside surface of the object cools much faster than the inside, which causes the glaze surface to shrink faster than the bisque. When the glaze surface no longer fits, it cracks. In rare cases, immediate crazing will occur because of incompatibility of the glaze to the clay body or vice versa. Today's hobbyist will experience this problem only when using an inferior clay body and/or home-formulated glazes.

Correction of crazing

Any object that has been glazed with a glaze that has a firing recommendation of witness cone 06 can be refired to witness cone 05, which will add some maturity to the bisque and may remove all crazing. However, the piece may craze again at a later date. Unfortunately, there are some glazes that do not perform

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Possible Problems

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properly when fired to witness cone 05 or hotter. When crazing occurs on objects that have been finished with these glazes, the refiring will remove the crazing but may also leave a less than desirable surface. The best protection against immediate or delayed crazing is properly fired bisque. *Always* bisque fire two cones hotter than you intend to glaze fire.

cone will work. If not, try applying a heavy coat of glaze and refiring.

off the ware. Shivering will occur if the glaze or the underglaze and the clay body are incompatible with each other, or if the bisque was overfired. In all cases, the clay shrinks more than the glaze, making the glaze too large to fit the body.

Grainy glaze surface

This signifies that the glaze was applied too thinly or badly overfired. The surest way to correct this is to heat the ware slightly (in a kitchen oven), apply a full, even coat of glaze and refire. When glazing over a fired glaze, heating the object first ensures that the glaze will dry and stay in place until it is again glaze fired.

Pinholed glaze

This condition can be caused by under-fired bisque, applying glaze to greenware, firing too rapidly, or poorly deflocculated casting slip. It is also possible that pin-sized holes were left on improperly cleaned greenware. Although this problem can almost never be solved, sometimes refiring to the proper cone or applying another coat of glaze before refiring will correct the problem.



Shivered glaze.

Creyed or discolored glaze

These results can be caused by ware being placed too close to an element, overfiring, insufficient application, firing incompatible glazes together, firing greenware with glazed items, applying a glaze to greenware, or by insufficient ventilation during firing. This can be difficult to correct; sometimes just refiring to the proper



Pinholed glaze.

Smooth textured glaze

If textured glazes are insufficiently applied, the desired texture will not be achieved and a smooth surface will result. Extreme overfiring can also cause textured glazes to flow out smoothly. Usually this can be corrected by reapplying glaze and refiring to the proper cone.

Shivering

The visible evidences of shivering are areas where the fired glaze has chipped or peeled away, or popped

Possible Problems by Color Family

color family

Problems

Causes

Solutions

Underglazes

to collect color don't scrub it into small pieces

E-Z Stroke Transiucen t Underglazes

Bleeding or color running.

Glaze applied over unfired underglaze colors; glaze applied too heavily; piece was overfired during the glaze firing.

No remedy.

Fading of colors.

Fired too cool; fired too hot; too much covering glaze applied.

If fired too cool, refire to proper cone.

Note: EZ 007 O/d Rose, EZ 005 Sierra Yellow, EZ 007 Royal Purple, ~~EZ~~ 008 Ruby Red, EZ 020 /Mulberry, EZ 021 Dark Orchid and EZ 030 Rose can fade when used for airbrushing techniques if insufficiently applied. Make a **small fired** test **before** airbrushing your actual ware to ensure desired results. Try CL 678 Blue White Clear **Brushing Gloss** Glaze over these airbrushed colors. Almost all airbrushed colors **will fire** lighter after the glaze is applied.

Peeling or chipping.

Applied too heavily; not bisque fired before glazing; applying underglaze to dirty or dusty surface.

No remedy.

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Possible Problems by Color Family

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Problems	Causes	Solutions
Cover-Coat Opaque Underglazes		
Cloudy colors.	Underfiring of a clear glaze; too heavy an application of a clear glaze.	If underfired, refire to proper cone.
Color is darker or brighter.	Fired too hot.	No remedy.
Color is somewhat translucent.	Poor (light) application; too hot a bisque firing.	No remedy.
Color running.	Glaze applied over unfired underglaze colors; glaze applied too heavily.	No remedy.
Color dull or not as bright.	Fired too cool in the bisque firing.	Try to refire at a hotter cone. This sometimes will work.
Dry or grainy surface.	A few Cover-Coats* have a tendency to soak up glaze.	Apply an additional coat of clear glaze and refire.
* CC 737 Regency Purple, CC 738 Wisteria, CC 740 Morocco Red, CC 746 Purple, CC 753 Avocado, CC 758 Bright Green and CC 760 Deep Purple. For best results, use CL 678 Blue White Clear Brushing Gloss Glaze over these colors.		
Peeling or chipping.	Applied too heavily; applied on dusty surface; glaze applied over unfired Cover-Coat.	No remedy.

Red-stroke Translucent Underglazes

Greying of color.	Under-applied Red-Stroke color, underfired or Red-Stroke Glaze was not applied.	No remedy.
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Red-Coat Opaque Underglazes

Color bleeding or pooling.	Red-Coat or final glaze applied too heavily and/or overfired.	No remedy.
Greying of color.	Underapplication of Red-Coat and/or glaze overfired.	No remedy.

Design-Coat Versa tile Underglazes

"Bridging" — color covers a crease on detailed bisque but leaves a space underneath. Color will "peel back" when fired, leaving a bare spot.	Color not brushed firmly into crevices or dust on ware.	No remedy.
Peeling of color.	Overapplication or hard spots.	No remedy.

Fired Antique Antiquing Underglazes

Crawling; cracking in crevices.	Applied too heavily; not wiped back enough.	No remedy.
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Glazes

Antique Glazes

Antiqued effect does not appear.	Glaze application too light.	Apply another coat and refire.
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Art Glazes

Matte effect lacking for metallic Art Glazes.	Underapplied and/or underfired.	If underfired, refire to proper cone.
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Possible Problems by Color Family

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Problems	Causes	Solutions
Crackletone Glazes		
Smoky mildewed look.	Carbon and water trapped in clay body.	No remedy.
Crystaltone Glazes		
Blistering.	Overapplied.	No remedy.
Crackling.	Heavy concentrations of crystals caused stress on bisque. (Rare.)	No remedy.
Cratering on Enamelware Crystal tones.	Underfired bisque; uneven application.	Try refiring to proper cone.
Lo-Sheen Glazes		
Ridging.	Uneven application; brush may have been too-small.	No remedy.
Surface more matte or more glossy than normal.	Overfired or underfired, depending on product.	If underfired, refire to proper cone.
Gallery Opaque Glazes		
Weak color.	Application too light.	Apply another coat and refire to proper cone.
Red-Stroke Glazes		
Crazing.	Applied to underfired bisque.	No remedy.
Woodtone Glazes		
Distressed and/or wormwood effect.	Specks not broken and pulled into streaks.	No remedy.
Muddy graining.	Overbrushed or glaze stirred in jar.	No r e m e d y .
Ridges or bubbles.	Uneven application.	No remedy.
Gloss Glazes		
GL 653 Downright White		
Fired surface looks as though the glaze had "fizzed" in the firing.	Fired while glaze was still wet or damp.	Future remedy: Allow glazed ware to dry thoroughly before firing.
Pitted, "orange peel" effect.	Application too thick; underfired.	Future remedy: thin glaze to normal creamy brushing consistency with water or Duncan Thin 'n Shade, or apply a thinned scrub coat before applying 3 undiluted coats.
Splitting.	Another glaze was used on a large area of the ware (for instance, Ultraclear rolled inside a piece glazed on the outside with Downright White).	No remedy.

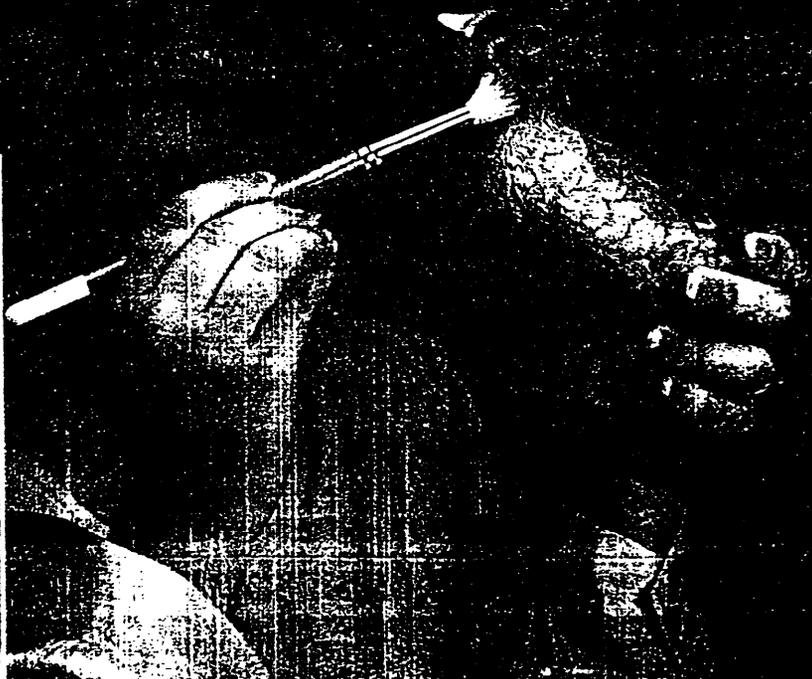
Note: Splitting will not occur when used alone. Downright White will not split ware when it is used over other glaze; for ornamental bands and trims, or in glaze combinations where it does-not cover extensive areas or all of the outside of a piece.

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Duncan Product Reference Manual

\$549



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Duncan

Introduction

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Answers, tips, explanations . . . information! Ceramics is even more enjoyable when you know the reasons why ceramic products work, and exactly how and when to use them.

The Duncan Product Reference Manual: *Ceramics* Fundamentals is a quick reference guide to every Duncan color family. While it is not a decorating technique book, various techniques will be mentioned when they demonstrate the versatile uses of a particular product.

With all this information at your fingertips, you can become a more independent, more creative ceramist, and the section, "Planning Your Project," clears up the mysteries and frees you to do what you want.

You'll also find information on other Duncan products such as tools and brushes, and helpful outlines of the basics of firing a kiln and casting a mold.

The manual explains how to advance your knowledge of ceramics . . . perhaps even establish a career . . . through the Duncan Educational Program.

Want more? There's more . . . a glossary that defines common ceramics terms, and a helpful Index.

The logo for Duncan, featuring the word "Duncan" in a stylized, cursive font. Above the letter "i" is a circular emblem containing a white silhouette of a ceramic vessel, possibly a bowl or a small pot, set against a dark background.

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Reading the Product Label

Each Duncan product label is much more than just a pretty front on a fine product. Actually, our labels are carefully designed to provide you with much convenient information about the use of our products.

The pictures show the three primary categories of labels that give you an overview of this information.

Glaze Labels

All labels in this group are in the burnt orange color range.

1 Order Number and Name

Each color has an individual order number and name. Duncan places colors in color-wheel sequence on our color charts to make it as convenient as possible for you to pick just the right color tone, tint or shade. Normally, you'll find each color placed in numerical order on your dealer's shelves. After you have

selected the color you want, find its order number and you'll locate it easily.

2 Opaque, Semiopaque, Transparent (colored), Clear

All glazes fall in one of these categories. The label identifies the transparency either in the name (Gallery Opaque Glazes) or on the label.

3 Dinnerware-Safe Glazes

Duncan is proud of its glazes that, when fired to witness cone 06, can be used safely on ceramic pieces that come into contact with food and drink. These glazes are identified with the notation **SAFE FOR FOOD CONTAINERS** on the front of the label. If a glaze you have chosen does not contain this phrase, do not use it for pieces that come into contact with food and drink. (For further information, see the section on Dinnerware-Safe Glazes).

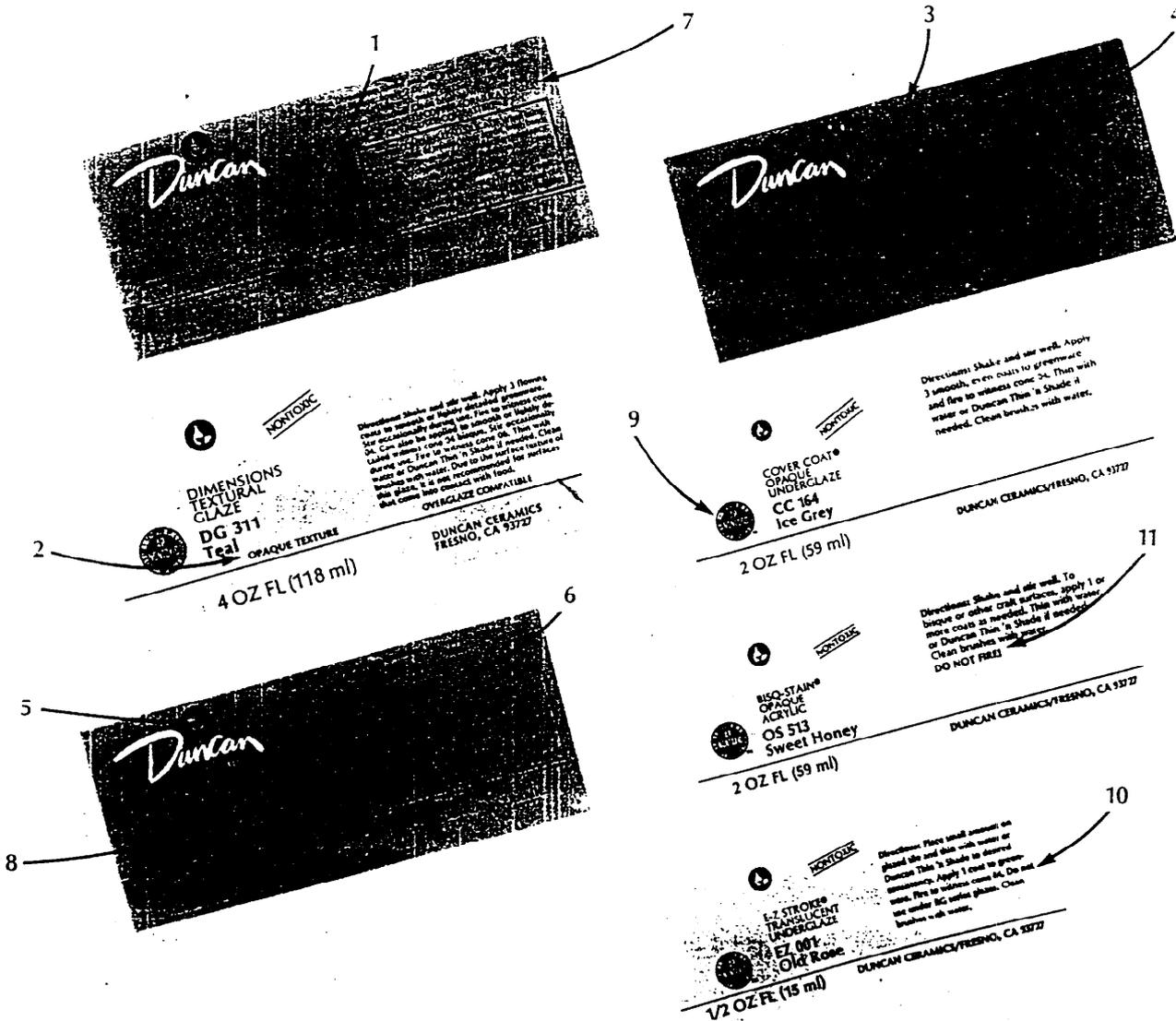
4 & 5 Overglaze Compatible

The use of an overglaze can really enhance the quality of a finished piece. Because some glazes contain small amounts of copper for color, they will not work with overglazes. Duncan glazes are all identified as to whether they will or will not work with overglazes. Glazes that will work with overglazes state **OVERGLAZE COMPATIBLE**. Glazes that do not work with overglazes state **NOT OVERGLAZE COMPATIBLE**.

6 & 7 Copper-Formula Glaze

Some glazes contain small amounts of copper for color. There are a few other Duncan glazes that, because of their formulation, should not be used or fired with glazes that are labeled **COPPER-FORMULA GLAZE**. These colors are identified on the label by **DO NOT FIRE WITH COPPER-FORMULA GLAZES**.

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Reading the Product Label

Directions

The general directions for applying or using the product are given on each label. Because each glaze has unique characteristics, you should read the **directions** for each color you're using to be sure the product is applied correctly. Sometimes products in the same family will **have** slightly different instructions- Read them **carefully** to ensure your **project's** success.

8 & 9 Health Label & Nontoxic Seal

Each Duncan color product carries either a health label or a **nontoxic seal**. These certify that our cautions are in compliance with national standards and the Art and Craft Materials Institute, Inc.

Underglaze Labels

All labels in this group are in the blue color range.

Order Number and Name

Same as for glazes.

10 Do not use under RG series glazes

A few underglaze colors are not recommended for use with Red-Stroke Glazes as they may fade. If an underglaze label does not have this notation, the underglaze is highly recommended for use with Red-Stroke Glazes and Red-Stroke.

Directions

Same as for glazes.

Health Label & Nontoxic Seal

Same as for glazes.

Nonfired Product Labels

All labels in this group are in the lavender color range.

Order Number and Name

Same as for glazes.

Directions

Same as for glazes.

11 DO NOT FIRE

All products that carry this identification on their labels should not be fired in a kiln.

Health Label & Nontoxic Seal

Same as for glazes.

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Underglazes

Many ceramists credit the fun of design work with underglazes for much of the creativity of ceramics. Underglazes have a fascinating number of uses, everything from signing the ware on the bottom of the piece to the finest of brushwork.

Underglaze Characteristics

Underglazes are ceramic colors which are used *under* a glaze. Four types of underglazes are available: translucent, opaque, antiquing and versatile.

Translucent

These are underglazes used for brushwork. They have a definite see-through quality. Normally, one color will show through another applied over it.



Translucent underglaze.

Opaque

These are underglazes used for solid-color coverage over large and small areas. Normally, if one color is applied over another, the base color will not show through.



Opaque underglaze.

Antiquing

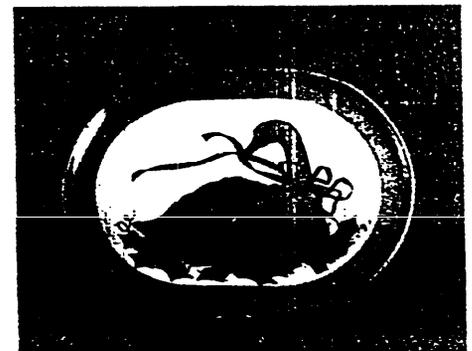
These are underglazes used for adding color highlights to a detailed piece (antiquing).



Antiquing underglaze.

Versa tile

These are underglazes that allow the accomplishment of all the above basic applications.



Versatile underglaze.

b4

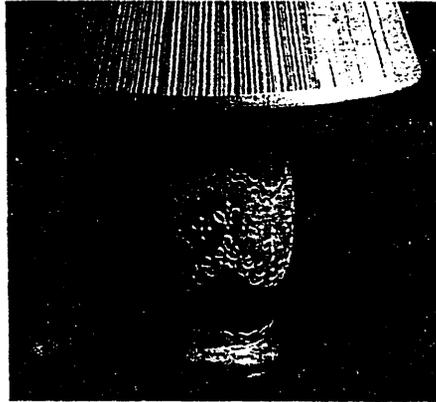
Glazes

950907CWE 727,

write to Duncan Ceramics, 5673 E. Shields Avenue, Fresno, California 93727 for safety instructions.

Application

Place DP 400 Clear Dipping Gloss in a container large enough to dip the ware without danger of touching the sides or bottom. Do not use tin to store the glaze in as it will rust and contaminate the glaze. To ensure an even coverage of glaze, stir the glaze thoroughly before using it and repeat stirring, periodically, during use. Quickly submerge the article in and out of the glaze, and set it aside until dry. If application is too thick, merely adjust by adding water until you reach the desired thickness. Although the fired results of dipping and brushing glazes are comparable in beauty, the two glazes should never be mixed together in their liquid state. Glaze fire to witness cone 06.



White Brocade.

vertical position so that only the tip is touching the design area. Holding the brush at a lower angle or applying more pressure will produce a wider line or pattern. **For** a different effect, Brocade can be thinned on a palette until it is like a heavy cream, and then applied with a plastic mesh sponge for a mottled look. If applied to greenware, bisque fire to witness cone 04. Thin with water or Thin 'n Shade if needed. Glaze fire to witness cone 06.



Fired Snow.

Application: Stir well to a smooth consistency before applying. Do not add water. Apply 1 or more good coats over unfired glaze which has been applied to witness cone 04 bisque. Depending on the size of the area to be decorated, apply Snow with a palette knife, brush, spoon, ice-cream stick, sponge or squeeze bottle. For very small areas or tiny pieces, a brush handle tip or a toothpick can be used. Allow to dry between coats. **Avoid** thin application. The heavier the application, the heavier the snow effect will be. Most ceramists use 1/2"- to 3/4"-thick applications on Christmas trees for the realism of a forest snowfall. On flat surfaces, a little less can be used. When dry, glaze fire to witness cone 06.

Special Effect Glazes

These glazes will give **you a variety of new and different results. The texture, finish or color, and the unique characteristics of each glaze let you decorate ceramics that display your personal touch.**

SY 543 White Brocade is a decorating glaze used for a raised or textured design, and will not flatten out in subsequent firings. It can be applied with a brush, sponge, squeeze bottle, brocade tool, or similar tool. It can be applied directly to greenware or witness cone 04 bisque, or over fired or unfired underglazes, White Froth or a nonflowing glaze that moves very little in the glaze firing. White Brocade can be tinted with undiluted E-Z Strokes straight from the jar. Add no more than 50% of the desired E-Z Stroke to White Brocade.

Application: For design work, it is best to thin the White Brocade with a few drops of water or Thin 'n Shade and build up the pattern by extra applications. Place some Brocade on a glazed tile or palette. Thin with water until the Brocade is the consistency of a light cream. Use a palette knife to thoroughly blend and mix the Brocade. Very fine lines can be accomplished by loading a Liner brush with the thinned Brocade and rolling just the tip of the brush to a sharp point. Hold the brush in a

Overglazes on Brocade: See Brocade Satin Base.

Brush and product care: Clean brushes with water. Wipe rim of jar and inside of lid, then close tightly.

SY 544 Brocade Satin Base by itself is a warm medium yellow glaze with a soft sheen. It was created as a base or foundation for use under White Brocade and metallic overglazes. This combination gives a beautiful two-toned dull and shiny three-dimensional surface.

Application: Shake jar and stir well. Apply 3 even coats to witness cone 04 bisque with a soft brush or a sponge. Next, apply White Brocade in any of the methods listed above. Fire to witness cone 06. After firing, apply 1 smooth coat of metallic overglaze. Fire to witness cone 019. Thin with water or Thin 'n Shade if needed.

Brush and product care: Clean brushes with water. Wipe rim of jar and inside of lid, then close tightly.

SY 546 Snow is formulated to produce thick, fluffy white "snow" on Christmas items, to create fur areas and trims on animals and figurines, and to form a beautiful snowy background for E-Z Stroke design

Brush and product care: Clean brushes with water. Wipe rim of jar and inside of lid, then close tightly.

SY 549 White Froth is a light, foamy glaze which produces a lava-type surface. White Froth can be tinted with E-Z Strokes. It is used on decorative items and also makes an ideal background for winter scenes painted with E-Z Strokes.

Application: Shake jar and stir well. To greenware, sponge on 3 or more coats. Fire to witness cone 06. Thin with water or Thin 'n Shade if needed.

Sponge and product care: Clean sponges with water. Wipe rim of jar and inside of lid, then close tightly.

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Underglazes

Underglazes are frequently thinned with water or Duncan Thin 'n Shade before application, and most decorating techniques will specify the consistency to which the underglaze colors should be thinned. In ceramics, consistencies are usually expressed in terms of everyday dairy products. You will find consistencies equated with thin milk, milk, light cream, cream, and so on. The lone exception is "wash," a very watery consistency, which is a watercolorist's term.

As you read about Duncan ceramic products, please refer to the Glossary in the back of this manual for definitions of unfamiliar terms.

Some basic application techniques, however, such as airbrushing, antiquing, banding, drybrushing, sgraffitoing, spattering, sponging, stenciling, stippling, etc., are illustrated and explained in a later section, as well as defined in the Glossary.

E-Z Stroke@ Translucent Underglazes

Characteristics

E-Z Stroke translucent underglazes are highly concentrated, *one-stroke* underglaze colors which are normally applied to greenware. They have a definite see-through quality, even when one color is applied over another. They should not be used for solid-color coverage, but for design work, simulated china painting techniques, plaid effects, or any other technique where a shaded or two-tone effect is desired. E-Z Strokes are also the preferred underglaze color medium for outlining and detailing, including eyes, personalizing with names and dates, and accenting designwork. E-Z Stroke translucent underglaze colors are most often used under a glaze. (Note: Some E-Z Stroke colors should not be used under RC series glazes. See specific E-Z Stroke label.) After they have been bisque fired to witness cone 04, cover the ware with any type of clear or transparent glaze.

Note: EZ 001 Old Rose, EZ 007 Royal Purple, EZ 008 Ruby Red, EZ 020 Mulberry, EZ 021 Dark Orchid,

EZ 030 Rose and EZ 040 Plum Blossom may sometimes fade a little under CL 617 *Ultraclear* and to an even lesser degree under CL 617 *Clear Brushing*. If you experience such a problem, substitute CL 618 *Blue White Clear Brushing*, which works quite well over these colors.

Application

E-Z Strokes can be used in several different ways.

Brushwork

For best results, place some E-Z Stroke on a glazed tile or palette and add water or Thin 'n Shade to reach the desired consistency — wash, milk, light cream or cream — for the specific effect you want to achieve. Working with color on a tile or palette allows more complete control of the amount and location of color picked up by your brush. Apply 1 coat to greenware. Use as large a brush as is practical and keep it well saturated for smooth, even brushstrokes. If your brush seems to drag when applying color to greenware, this will indicate that the color is too thick and that a drop or two of water or Thin 'n Shade is needed to thin the color to the proper working consistency. For shaded brushwork, load the brush with color, then tip or sideload the brush with a second color.

Over other underglazes

E-Z Stroke colors are very effective when applied over each other or over opaque underglazes. They can be used in design over a background of sponged or stippled color as well as over solid-color backgrounds. Whether they are used as the design or as shading for other underglazes, keep in mind that they are translucent and might be altered in color by the color used underneath them.

Airbrushing E-Z Stroke

The concentrated color strength of E-Z Stroke colors is ideal for use in airbrush decoration. Thin the color with Duncan Thin 'n Shade, using four parts of Thin 'n Shade to one part color. Airbrush the thinned color onto the greenware, passing over the desired area(s) until the intensity of the color on the ware is the equivalent of the color in the jar.

Banding

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The one-stroke E-Z Stroke colors are ideal for banding on color. Thin the color with water or Thin 'n Shade to a milk or light-cream consistency, and band on 1 coat to greenware or over a base-coat color.

Spattering

Thin the E-Z Stroke color with water or Thin 'n Shade to a milk consistency and use a stiff brush to spatter the color onto the base-coated or decorated greenware item.

Sponging

Place some E-Z Stroke Color on a glazed tile, acid water or Thin 'n Shade and mix to the consistency specified by the technique you are using (often milk or thin cream). Spread the color shallowly over the tile with a palette knife. Use a slightly dampened sponge to apply 1 coat of color directly to greenware or over a base-coat color in patterns or to create background areas, letting the underlying surface show through here and there. More than one color can be sponged on a single item.

Stenciling

Thin the E-Z Stroke color with water or Thin 'n Shade to the consistency of thin cream. Apply a coat of the thinned color through the stencil openings with a sponge or brush onto greenware or over a background color.

Stippling

Place some E-Z Stroke color on a glazed tile and thin with water or Thin 'n Shade to a milk or light-cream consistency. Use your Duncan Stippler brush to stipple on 1 coat of color with quick up-and-down pouncing strokes to greenware or a background color.

Antiquing

To use E-Z Stroke as an antiquing medium, mix the color with water to make a thin wash. Use a small amount on a large palette to mix the color. Do not thin the entire jar. Apply the color wash to witness cone 04 bisque using as large a brush as is practical. Wipe the piece down with a dampened sponge to remove the excess color from the raised areas.

Underglazes

Clean the sponge frequently as you work. When the piece is thoroughly dry, glaze with a clear or transparent glaze and fire to witness cone 06.

Over a glaze

E-Z Stroke can be used effectively over unfired glazes and then fired to witness cone 06. Designs, patterns or scenes can be painted over nonmoving glazes. The E-Z Stroke colors should be thinned with water or Thin 'n Shade to a consistency no heavier than light cream and applied in 1 or 2 light coats rather than a heavy coat. Too heavy or too thick an application may produce a textured effect or blisters on the color area. Unusual effects can also be obtained when E-Z Strokes are applied over flowing glazes such as glosses. The colors will change somewhat in tone depending on the choice of colored glaze used, the shape of the bisqued piece, and the cone to which it is fired. As the glaze flows during the firing, the E-Z Strokes will also flow, creating one-of-a-kind effects.

Bisque application

Although E-Z Strokes are primarily designed for application on greenware, E-Z Stroke colors are used on witness cone 04 bisque when an antiqued finish is desired and can be used successfully on bisque just as you would use them on greenware if you lightly dampen the bisque with clean water before applying the E-Z Stroke color. Bisque is very porous and unless it is predampened, it will absorb the moisture from the color too quickly, making a smooth stroke impossible to obtain. If E-Z Stroke is used for design on bisque, it is not necessary to fire the piece before applying a glaze, providing the E-Z Stroke is thoroughly dry and the glaze is glazed with a fully loaded brush so the underlying colors are not disturbed.

As a colorant

E-Z Stroke colors can be blended or mixed together to create additional color hues. They can also be used to tint White Froth, White Brocade and Snow Special Effects Glazes. The usual mixing proportions are no more than 50% E-Z Stroke. They are also ideally suited for coloring ceramic or porcelain casting slip because they are strong, highly concentrated colors.

When mixing or color blending, we recommend that a small fired test sample be made to determine the proper mixture for the desired effect.

Firing

Always be sure of a proper firing, usually to witness cone 04. E-Z Stroke colors can be fired from cone 06 to cone 6. It is difficult to over-fire the colors, but underfiring them can present problems. Under-fired colors may not be as bright as they should be, or they may be streaked or have a pale, mottled appearance.

On porcelain and stoneware

E-Z Stroke colors have been designed to perform through a wide firing range. Most of the colors fire true to color up to a cone 6 firing, but some colors may fade or change color at such a high temperature, due to their chemical nature. Test-firing is recommended. Thin with water or Thin 'n Shade to the consistency specified by the particular decorating technique you are using and apply to porcelain or stoneware greenware. Bisque fire to the maturing cone recommended by the high-fire slip manufacturer, witness cones 4 to 6. (See the "Color information index" in the Duncan Color Selection Guide for high-fire color information.)

Brush and product care

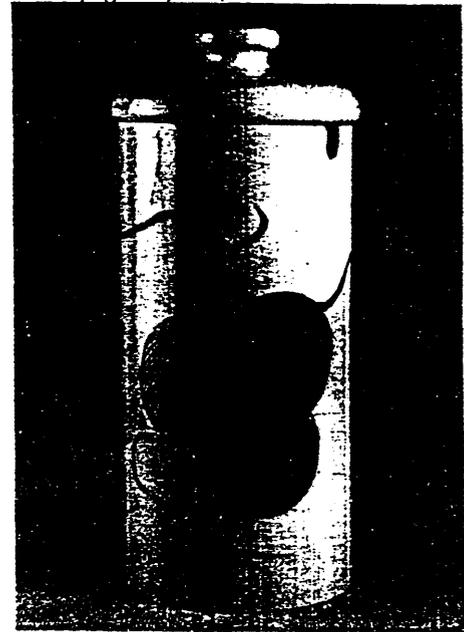
Clean brushes with water. Wipe rims of jars and insides of lids, then close tightly.

Red-Stroke@ Translucent Underglazes

Characteristics

These intensely brilliant translucent underglazes are one-stroke underglazes. The Red-Strokes are used for fine detailing, design work and shaded effects, alone or with most other Duncan underglazes. Their see-through qualities allow one Red-Stroke color to be used over another, and this same translucency means that they are not to be used for solid-color coverage of large areas. With Red-Strokes, you can decorate with distinctively bright colors.

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Many different color products work beautifully with Red-Strokes.

Red-Strokes must be applied to witness cone 03 bisque and they must be covered with dinnerware-safe Red-Stroke Clear before firing. This is the only glaze formulated for perfect results over Red-Stroke translucent underglazes, except for CL 100 Clear Brushing. Do not use any other clear of transparent glaze over Red-Strokes, for glaze substitution will cause the colors to gfy out.

Application

Make sure your bisque (witness cone 03) is clean and dust-free. (Note: Also apply to witness cone 03 bisque when using Red-Strokes with other Duncan underglaze colors.) Red-Stroke colors can be applied with a brush, sponge or airbrush. When using more than one color, allow to dry between different color applications. Allow to dry before glazing. Red-Strokes do not need to be fired before glazing.

Brushwork

Place some Red-Stroke color on a glazed tile and work with a palette knife to obtain a good brushing consistency. Working with the color on a tile also allows more complete control of the amount and location of color picked up by your brush. Apply 1 coat to witness cone 03 bisque.

Use as large a brush as is practical and keep it well loaded for smooth, even brushstrokes. Normally, thinning

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Underglazes

is not needed. If your brush seems to drag as you are applying color to the bisque, add a drop or two of water or Thin 'n Shade to thin the color to the proper working consistency.

A i&rushing

Thin the color with Thin 'n Shade, using two parts of color to one part Thin 'n Shade. Airbrush the thinned color onto the bisque, passing over the desired area(s) until the intensity of the color on the ware is the equivalent of the color in the jar.

Spattering

Thin the Red-Stroke with water or Thin 'n Shade to a milk consistency and use a stiff brush to spatter the color onto desired areas of witness cone 03 bisque.

Sponging

Place some Red-Stroke color on a glazed tile and spread shallowly with a palette knife. Use a slightly dampened sponge to apply the color to witness cone 03 bisque in patterns or to create background areas.

Antiquing

Apply full-strength Red-Stroke to a detailed piece of bisque that has been fired to witness cone 03. Wipe the piece down with a dampened sponge to remove excess color from the raised areas. Clean the sponge frequently as you work. Allow the piece to dry thoroughly before glazing with Red-Stroke Clear or GL 100 Clear Brushing.

With E-Z Strokes

The Red-Stroke colors can be used in design with most E-Z Stroke translucent underglazes. You can load a brush with a Red-Stroke color and tip it in a contrasting E-Z Stroke color for shaded brushstrokes. A design painted with Red-Strokes can be accented with E-Z Stroke colors. In the same manner, an E-Z Stroke design can be accented with Red-Strokes. Remember, however, to use the E-Z Strokes on bisque or, if you prefer to use E-Z Strokes on **greenware**, bisque fire to witness cone 03 before accenting with Red-Strokes. (Note: Witness cones for best fired results with each product are given throughout this manual. Certain products, like Red-Strokes, are so

exceptional that their witness cone requirements take precedence over those of any other color products *used with them.*) Always use Red-Stroke Clear or GL 100 Clear Brushing over any ware decorated with a combination of Red-Strokes and E-Z Strokes.

Over other Red-Strokes and over Cover-Coats, Red-Coats and Design-Coats

Red-Strokes are very effective applied over one another and are beautiful over most fired Cover-Coat opaque underglazes and Design-Coat versatile underglazes, and over unfired Red-Coat opaque underglazes. (Note: *The Cover-Coats should be bisque fired to witness cone 03, and the Red-Coats and Design-Coats applied to witness cone 03 bisque. See note on firing in "With E-Z Strokes" above.*) The Red-Strokes can be used in design over a background of sponged or stippled color as well as over: solid-color backgrounds. Whether they are used for design or as shading for other underglazes, keep in mind that the Red-Strokes are translucent and might be altered in appearance by the underlying color. When in doubt, make a small fired test piece.

Not for porcelain and stoneware

Due to their formulation, the Red-Strokes are not recommended for use on porcelain and stoneware. These colors do not work at high-fire temperatures.

Brush and product care

Clean brushes with water. Wipe rims of jars and insides of lids, then close tightly.

Cover-Coat@ Opaque Underglazes

Characteristics

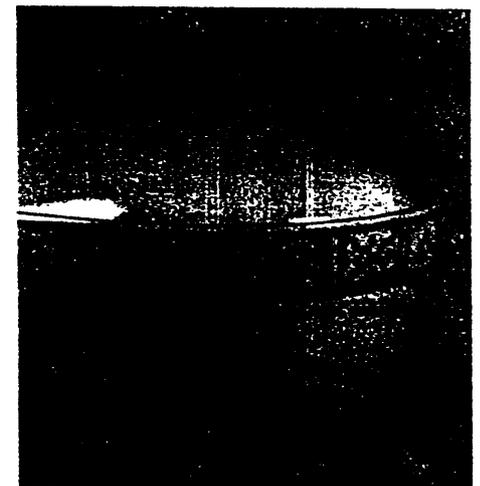
Cover-Coats are opaque underglazes. These opaque colors are to be used when areas of solid-color **coverage** are desired. When one color is properly applied over another, the second color will totally block out the first color. Cover-Coats are applied directly to **greenware** and then bisque fired to witness cone 04. The color actually becomes a part of the **ceramic** object. A glaze finish is

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required to seal the porous surface and to brighten the underglaze colors, although the fired colors can be left unglazed for decorating effects like the terra-cotta look or polished Cover-Coat. For most Cover-Coats, any transparent glaze can be used. (Note: *Some Cover-Coat colors should not be used under RG series glazes. See specific Cover-Coat label.*) On any nonutility item, a nonfired Ceramic Spray or Brush-On Sealer can be used as a finishing coat. Cover-Coat colors will have a more pastel quality when nonfired sealers or matte-finish glazes are applied than when they are finished with a fired Gloss Glaze.

Note: CC 737 Regency Purple, CC 138 Wisteria, CC 739 Orchid, CC 140 Morocco Red, CC 746 Purple, CC 757 Rose, CC 760 Deep Purple and CC 172 Plum Blossom may sometimes fade a little under CL 617 Ultraclear and to an even lesser degree under CL 677 Clear Brushing. If you experience such a problem, substitute CL 678 Blue White Clear Brushing, which works quite well over these colors.

Application

Shake jar and stir well before using. Cover-Coat should be the consistency of heavy cream and can be thinned with water or Thin 'n Shade if it is too thick. It can be applied in several different ways.



Cover-Coats produce smooth coverage with very little trouble; only 3 coats.

Brushing application

Apply 3 smooth, even coats to **greenware** in one direction, whenever the piece permits.

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Underglazes

Sponging application

Dip a slightly dampened sponge into the color and sponge on 3 even coats, using an up-and-down pouncing motion. One coat of another color can be sponged here and there over the first to give a multicolored effect.

Airbrushing

Thin the color with Thin 'n Shade, using **one part Thin 'n Shade to two parts color**, Airbrush the thinned color onto the greenware, passing over the desired area(s) until the intensity of the color on the ware is the equivalent of the color in the jar & then airbrush the same areas a second time.

Sgraffitoing

Apply the color by brushing or sponging, then sketch on the design. While the color is still damp, use the Sgraffito-Duster tool with the hollow side of the blade down to gently scratch fine shallow lines along the design lines, then go over the lines a few more times to gradually deepen and widen the lines. Use the brush end of the Sgraffito-Duster tool to remove dust and clay particles from the sgraffitoed lines. Bisque fire the ware to witness cone 04 and apply the desired glaze.

Thickened Cover-Coat

A few drops of vinegar added to Cover-Coat will thicken it so that it can be used to create raised designs. Apply the thickened color with a brush or sponge. (Note: This does not work for all Cover-Coats, so always test before planning a project.)

Polished finish

This nonglazed finish is used on nonutility items. Apply the color as directed under Brushing or sponging application, then apply another coat of color thinned half and half with water to a small area of the greenware at a time. When the wet look disappears from the newly painted area, polish it briskly with a soft cloth until a sheen is obtained. Overlap the areas slightly so that no unpolished spots will remain. When the entire surface of the ware is polished, bisque fire it to witness cone 04. No additional finish is required. (This

finish is water resistant, but not waterproof.) Polished Cover-Coat is excellent as a background for spot glazing.

Firing

On a low-fire clay body, Cover-Coats should be fired to witness cone 04.

On porcelain and stoneware

When thinned with water or Thin 'n Shade to a thin-milk consistency, many Cover-Coat colors can be applied to porcelain and stoneware, and fired to the maturing cone recommended by the high-fire slip manufacturer, witness cones 4 to 6. At these temperatures, most Cover-Coats will undergo a color change. Test-firing is recommended. The surface finish may also change. Some Cover-Coat colors become highly glossy, some attain a slight sheen, and some fire to a completely matte finish. All the Cover-Coats bond firmly to the ware and create some very beautiful effects. Apply thinned Cover-Coat to porcelain or stoneware greenware as directed for low-fire clay bodies. Bisque fire to the maturing cone recommended by the high-fire slip manufacturer, witness cones 4 to 6. (See the "Color Information Index" in the Duncan Color Selection Guide for high-fire color descriptions.)

Brush and product care

Clean brushes with water. Wipe rims of jars and insides of lids, then close tightly.

Red-Coat® Opaque Underglazes

Characteristics

These opaque underglazes are three-coat underglazes. They are especially formulated to produce intense, brilliant colors, and are used for solid-color coverage, trims, and extra touches of color on all kinds of decorative items and dinnerware.

Application

Red-Coat colors should be used only on bisque that has been fired to witness cone 04, unless they are used with Red-Strokes on witness cone 03 bisque. We do not recommend them

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for use on greenware, as the color may turn dirty looking and develop black spots. Shake jar and stir well before using.

Brushing application

Apply 3 flowing coats with a soft brush. Three full coats are necessary to avoid greying of color, especially on sharp edges. For best results, apply no more than 3 coats, as Red-Coat colors may run slightly in the firing if they are applied too heavily. When Red-Coat application is completed, set ware aside to dry thoroughly before glazing.

Sponging application

Dip a slightly dampened sponge into the color and sponge on 3 even coats to witness cone 04 bisque, using an up-and-down pouncing motion.

Airbrushing

Thin the color with Thin 'n Shade, using one part Thin 'n Shade to two parts color. Airbrush the thinned color onto the bisque, gassing over the desired area(s) until the intensity of the color on the ware is the equivalent of the color in the jar.

With Red-Stroke translucent underglazes

When Red-Coats and Red-Strokes are used on the same witness cone 03 bisque ware, the item must be glazed with Red-Stroke Clear or GL 100 Clear Brushing and fired to witness cone 06. (See Red-Strokes and Red-Stroke Glaze for additional information.)

With E-Z Stroke translucent underglazes

After the E-Z Stroke-decorated ware has been bisque fired to witness cone 04, Red-Coat areas can be added to the bisqued item. Be careful not to apply the Red-Coat over the E-Z Strokes as the opaque Red-Coat colors will block them out. While E-Z Stroke detailing and accents can be added over Red-Coats applied to witness cone 04 bisque, remember that the E-Z Strokes are translucent and may be altered in appearance by the underlying color. Making a small fired test-piece is recommended before decorating your actual piece.

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Underglazes

With Cover-Coat opaque underglazes

Greenware items partially decorated with Cover-Coats and bisque fired to witness cone 04 can be completed with areas of Red-Coat colors. If Red-Stroke accents or shading will also be used, the greenware decorated with Cover-Coat colors should be bisque fired to witness cone 03. When Red-Coats are used on an item decorated with Cover-Coats, any appropriate glaze can be used, but if Red-Stroke colors are added to the item, it must be glazed with Red-Stroke Clear or GL 100 Clear Brushing.

With Design-Coats *versa tile* underglazes

Because the Design-Coats can be applied to bisque as well as to greenware, they are ideal for use in design with the Red-Coats. For solid-color areas, apply 3 flowing coats of either the Design-Coat or Red-Coat color. Do not overlap the colors, because both these colors are opaque when 3 undiluted coats are applied. The Design-Coats can be thinned with water or Thin 'n Shade and used to create designs, detailing and shading over the dry Red-Coat color(s). Note that thinned Design-Coat colors are transparent, and so their appearance can be altered by the Red-Coat color underneath. When in doubt, make a small fired test piece.

Not for porcelain and stoneware

Due to their formulation, the Red-Coats are not recommended for use on porcelain and stoneware. These colors do not work at high-fire temperatures.

Brush and product care

Clean brushes with water. Wipe rims of jars and insides of lids, then close tightly.

Design-Coat™ Versatile Underglazes

Characteristics

Design-Coats are excellent for both opaque coverage and translucent design work. They can be applied to **greenware** or witness cone 04 bisque.

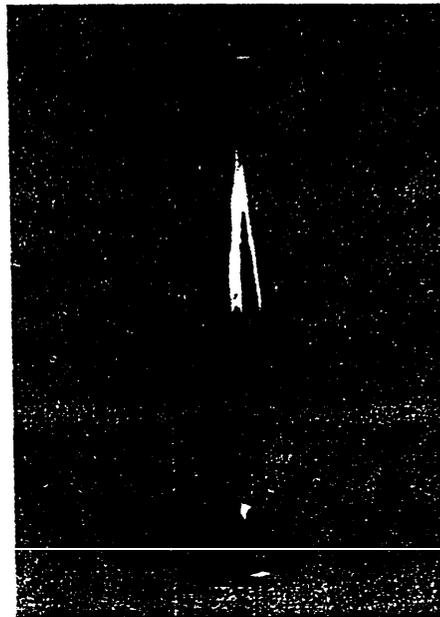
Design-Coats can be left unglazed for a very matte appearance (the bisque look) or glazed to obtain a smooth, glossy finish. These colors can be mixed to create custom colors. Experiment to find the exact color mixture you want, then mix enough color to complete your project.

A p p i c a t i o n

Design-Coats can be brushed or sponged on, or used as an antiquing agent.

Opaque coverage on greenware

Damp sponge greenware, then thin the Design-Coat with Thin 'n Shade (approximately one teaspoon Thin 'n Shade to one 2-oz. jar). Apply 3 coats, brushing each coat in the same direction. Allow to dry between coats.



Solid-color coverage.

Translucent design work on greenware

Thin with Thin 'n Shade to the desired consistency and apply.

Opaque coverage on bisque

Damp sponge bisque with water to remove surface residues, slightly dampening ware, and apply 3 coats of Design-Coat, brushing each coat in same direction. Allow to dry between coats.

Translucent design work on bisque

Thin with Thin 'n Shade to the desired consistency and apply.

Antiquing on bisque

Thin with Thin 'n Shade to a wash consistency, apply one coat, then wipe away excess with a damp sponge.

Firing

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Greenware: When Design-Coats are applied to greenware, fire ware to witness cone 04. You may choose to leave the ceramic piece as 'is, after the first firing, or to apply an appropriate Gloss Glaze and refire to witness cone 06.

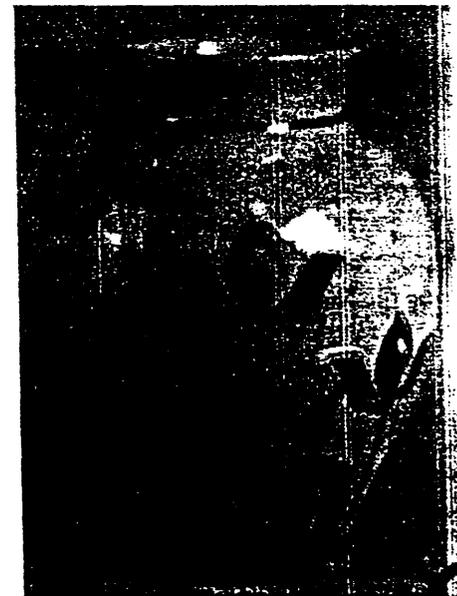
Bisque: When Design-Coats are applied to witness cone 04 bisque, apply the desired glaze directly over the dry unfired Design-Coat, then fire to witness-cone 06.

Decorative applications

Specific instructions are given under each application mentioned below. Thin with water or Thin 'n Shade if needed.

One-stroke design work

Brushwork designs can be created with Design-Coats on greenware, bisque, or on a Design-Coat background of contrasting color. Load your brush with color straight from the jar, or place a small amount of color on a glazed tile for greater control of amount of color picked up by the brush. To achieve extra-fine linework or brushstrokes, moisten brush with Thin 'n Shade and squeeze out excess, then load brush



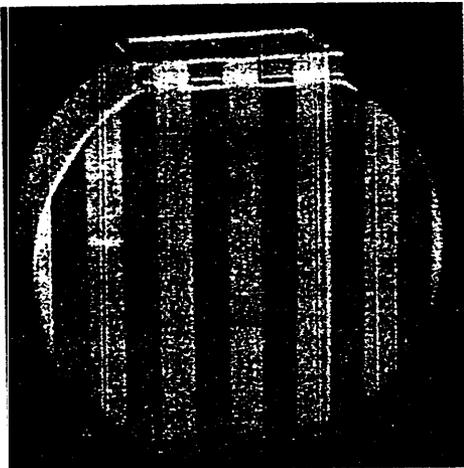
One-stroke design.

Underglazes

with color. Shaded brushstrokes can be obtained by loading one side of the brush with one color, and the other side or the tip of the brush with a second color. For more translucent brushwork, thin the Design-Coat colors with water or Thin 'n Shade.

Bisque-look techniques

The versatile Design-Coats produce a beautiful, matte texture when they are not glazed. This characteristic lets you create many fascinating special effects.



Bisque look with stripes of glaze.

Airbrushing

Thin the color with Thin 'n Shade, using one part Thin 'n Shade to one part color. Airbrush the thinned color onto the greenware or bisque item, passing over the desired area(s) until the intensity of the color on the ware is the equivalent of the color in the jar.



Antiquing.

Antiquing

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Mix equal parts of a Design-Coat color with water or Thin 'n Shade and flow on 1 coat to incised or detailed bisqueware. Wipe back with a slightly dampened sponge.

Banding

Thin with water or Thin 'n Shade if necessary. Use a brush to band on 3 flowing coats of Design-Coat color.

Spattering

Load a stiff brush heavily with Design-Coat color. Hold the brush several inches above the ware and run your fingertip through the bristles to produce a fine spray of color. Two or more colors can be spattered on the same piece.

Sponging

Spread a small amount of Design-Coat color on a glazed tile. Load a slightly dampened sponge with color and sponge 1 good coat over contrasting Design-Coat background. If desired, two or three colors can be sponged on the same piece. Note that different effects can be achieved depending on the fine or coarse texture of the sponge.

Stenciling

Spread the desired Design-Coat color on a glazed tile. Use a Stencil brush to apply 3 coats of color through the stencil. Alternate methods: sponge or stipple 3 coats. Because Design-Coats are opaque, stencil designs can be overlapped and a contrasting color will blot out the overlapped part of the design.

Stippling

Load your Deerfoot Stippler brush with a Design-Coat color, blot excess color on a paper towel, then stipple color onto a contrasting Design-Coat background with a quick up-and-down pouncing motion.

On porcelain and stoneware

Design-Coats can be high fired when applied to porcelain or stoneware. Run a comprehensive test, as some colors change at witness cone 6. (See the "Color information Index" in the Duncan Color Selection Guide for high-fire color descriptions.)

On porcelain, Design-Coats yield either a dull satin or a dull gloss. A final coating of a clear Gloss Glaze produces a high-gloss version of the color used. One-stroke designs with Design-Coat colors on porcelain produce "china painting" effects. Apply **milk-consistency** Design-Coat to **porcelain greenware** or to witness cone **04 porcelain bisque**, then fire to the maturing cone recommended by the high-fire slip manufacturer; witness cones 4 to 6.

On stoneware, Design-Coats produce either a dull satin or a dull gloss. The use of a finishing glaze is not recommended, because the grog in the stoneware body may react with the glaze. Application is the same as for porcelain. Fire to the maturing cone recommended by the high-fire slip manufacturer; witness cones 4 to 6.

Tips

1. The cleaner the bisque, the better the results. Always sponge bisque with water prior to Design-Coat application.
2. Keep hands clean; especially free of grease.
3. Care should be taken not to allow color to gather in crevices. Use a brush to remove excess Design-Coat from recessed areas.
4. Red-Strokes with Design-Coats: Apply Design-Coats only to greenware, fire to witness cone 03, apply Red-Strokes, then glaze with Red-Stroke Clear or GL 100 Clear Brushing and fire to witness cone 06.

Note: *Lo-Sheen Glazes* are not recommended for use with Design-Coats, due to a tendency to discolor the Design-Coat color.

Brush and product care:

Clean brushes with water. Wipe rims of jars and insides of lids, then close tightly.

Fired Antique Antiquing Underglazes

Characteristics

Designed for antiquing embossed or incised **witness cone 04 bisque**, these underglazes can also be used for design work, for shading or over

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Underglazes

other unfired underglazes on bisque. (Note: Some Fired Antique colors should not be used under RC series glazes. See specific fired Antique label.)

Application

Shake jar and stir well before using. Add water or Thin 'n Shade to maintain consistency of thin milk. Fired Antiques can be used in several different ways.

Antiquing

Thin with water or Thin 'n Shade to a thin-milk consistency. Apply to witness cone 04 bisque with a soft brush, making sure color penetrates all crevices. Wipe down with a clean, damp sponge, cleaning the sponge

frequently as you work, until the desired effect is obtained.

Design work or shading on bisque

Place a small amount of the Fired Antique color on a glazed tile or palette to control the amount and location of color picked up by the brush. Consistency of the color should never be heavier than light cream. Apply 1 coat to witness cone 04 bisque. Since the color may thicken on the tile as you work, add a drop of water or Thin 'n Shade occasionally to maintain this consistency. Allow to dry thoroughly before glazing.

On porcelain and stoneware

Most Fired Antique colors perform

well through witness cone 6, but some colors may fade or change color at such a high temperature, due to their formulation. Test-firing is recommended. Thin with water or Thin 'n Shade to the consistency specified by the particular decorating technique you are using and apply to witness cone 04 porcelain or stoneware bisque. Fire to the maturing cone recommended by the high-fire slip manufacturer, witness cones 4 to 6. (See the "Color Information Index" in the Duncan Color Selection Guide for high-fire color descriptions.)

Brush and product care

Clean brushes with water. Wipe rims of jars and insides of lids, then close tightly.

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Glazes

Much of the beauty and mystery of ceramics comes from the pure magic of glazes. From the shining, glass-like brilliance of a clear Gloss Glaze to the surprising realism of Woodfone Glazes, the wonderful transformation we see after the glaze firing is the reason for the eternal fascination of ceramics.

Glaze Characteristics

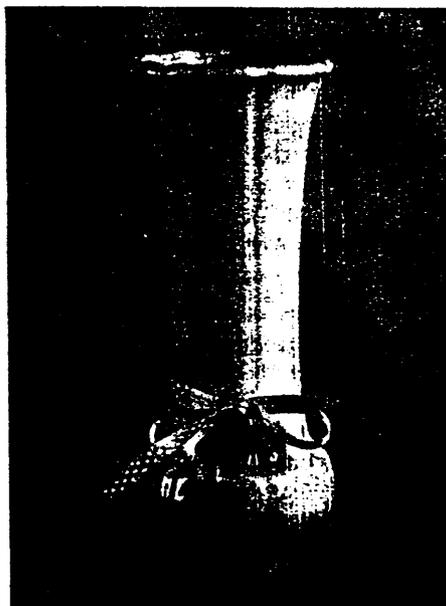
Because ceramic glazes are available in a wide variety of colors and surface textures, and since the fired finish is so dramatically different in appearance from the liquid glaze, it is helpful to understand the characteristics of each glaze.

Glazes are commonly defined by how much color and transparency they have. Each glaze will fall into one of the following four categories.

Opaque

Glazes that fall under this category are generally used for solid-color coverage on smooth or slightly

detailed bisqueware. Generally, underglazes are not used with opaque glazes because only the very darkest colors will show through the glaze.

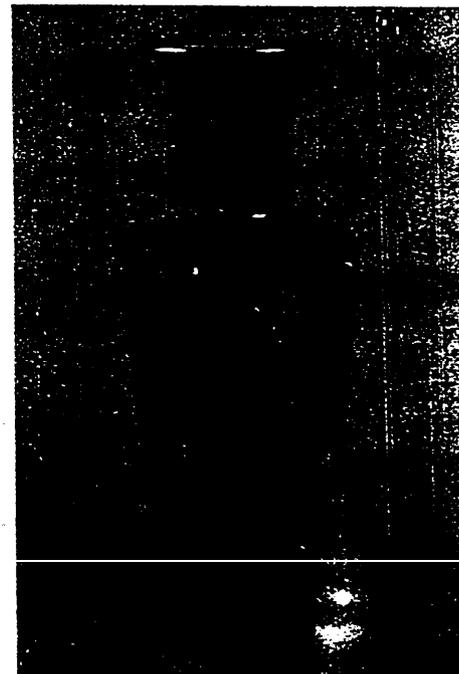


With opaque glaze.

Semiopaque

These glazes are best used for solid-color coverage over detailed

bisqueware. Some dark underglazes will show under semiopaque glazes; however, testing is recommended. If used on smooth bisqueware, extra care in application must be used to avoid streaking.



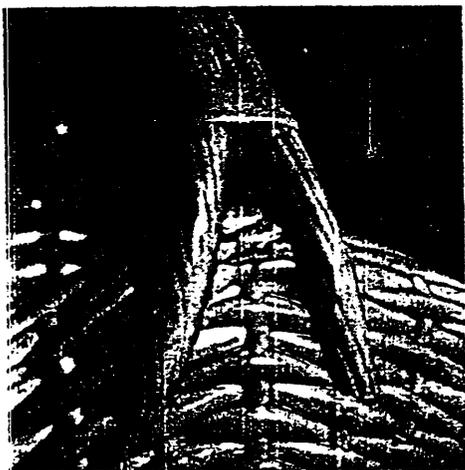
With semiopaque glaze.

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Glazes

Transparent (colored)

These glazes are ideal over underglazes to highlight and add an accent of color. Dark glazes may alter the underglaze color while light-colored glazes will not. Transparent colors are also recommended for single-color application over highly detailed bisqueware as the color will tend to be intense in the crevices (self-antiquing).



With transparent glaze.

Cleat

These are truly clear glazes that contain no color and produce a clean white finish when applied to straight bisque. (Some may contain specks as accents.) Underglazes show up with no color distortion.



With clear glaze.

Dinnerware-Safe Glazes

Whenever you select a glaze for application to food and drink containers, check the jar label for the statement: **SAFE FOR FOOD CONTAINERS**. Duncan glazes with labels which carry this statement are

dinnerware safe when properly fired to witness cone 06 and comply with the Food and Drug Administration's safety requirements concerning lead and cadmium release. These glazes may contain some lead and/or cadmium, but in a form and quantity which produces a safe glazed surface when used according to directions on the label.

Duncan glazes conform to the stringent standards set down by the International Organization for Standardization, World Health Organization, United Nations. These glazes are submitted for regular testing by an independent testing laboratory.

We recommend that all utility-type greenware items be bisque fired to witness cone 04 and that the glaze be fired to witness cone 06. This will give a good, durable surface with less danger of any delayed crazing of thermal shock.

All Duncan glazes can be used on any surface that does not come in direct contact with any food or drink. Furthermore, you can use any glaze on the outside of a container as long as the inside surface where food or drink contacts it is one of the glazes on the approved list, and the glazes chosen are compatible with each other.

All Duncan underglazes are perfectly safe to use on dinnerware under any acceptable glaze.

In summary, Duncan glazes are safe to use on dinnerware and cups to contain food and beverages when the proper glazes are chosen and when they are applied and fired correct ly.

Note: Dinnerware-safe glazes, when mixed together or applied over one another, combine chemically and may produce a finish which is not safe to use on surfaces that come in direct contact with any food or drink.

Glazing Tips

When using glazes, these are the major points to remember:

1. Start with a good hard bisque piece that has been fired to at least witness cone 04.
2. To remove dust, damp sponge the bisque for a final cleanup.

3. Make sure your work area is clean and that your hands are free of any oil, hand lotion and salt.
4. Follow recommended application on glaze label.
5. Whenever possible, apply glaze in one direction.
6. Be sure that all the glazes you fire in a kiln load are compatible.
7. Keep pieces at least 1/2" apart to prevent contamination of fumes from another glaze.
8. Vent properly and fire to recommended cone temperature.
9. Avoid a long or extended firing cycle or a short, fast firing. Glazes do best when fired under a normal and consistent temperature range.
10. Keep jars tightly closed when not in use.

Antique Glazes

Characteristics

Beautiful frosted finishes, ranging from two to three shades of color. Very effective when applied to a very smooth-surfaced article and extremely handsome on detailed pieces, provided the detail is not very fine and shallow.



Antique Glaze.

Application

Apply 3 heavy coats to witness cone 04 bisque. These glazes must have a heavy application of glaze to produce the antique frosted look. Allow to dry, then fire to witness cone 06. Thin with water or Thin 'n Shade if needed.

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